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Review on FACTS devices integrated with TSR

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ABSTRACT
Maximum power transfer capability in the transmission line is the extreme important consideration in power systems. VAR Compensator (SVC) and Static Synchronous Compensator (STATCOM) are significant devices in FACTS family, and is broadly recognized as an efficient and reasonable means to solve the power system stability problem. At present the demand of electrical power is growing day by day with a quick as a flash rate, so we require much able transmission and distribution system with the a large amount outstanding quality of supply.
Keywords: Maximum Power Transfer Capability, Optimal Placement, STATCOM, SVC, SERIES COMPENSATION.

I. INTRODUCTION

Over the past two decades, electric power systems have knowledgeable a continuous increase in power require without a matching growth of the transmission and generation facilities. Global transmission systems are undergoing continuous vary due to steady growth in demand for electric power, most of which has to be transmitted over a long distances. It is not that much is easy to create an new plant or placing an additional machine for power generation to meet up the load. However there are some short term methods to meet up the demand, In which the Transmission interconnections are enable taking advantages of diversity of loads, availability of sources and fuel prices in order to supply at minimum cost with required reliability
Flexible AC transmission system offers many potential benefits to power systems. Specific applications of FACTS devices for line flow control, active & reactive power flow control, loss minimization, capability of flexibility in operation & control and spread reactive support to locations in the system where support is needed. To overcome the power quality problem of distribution system, we have number of power quality solution techniques by using FACTS controllers, which use newly available power electronics devices.

1.1 Shunt capacitive compensation:

This method is used to progress the power factor of the system. Generally for inductive load the current lags the voltage so that the power is lagging power factor. To compensate the lagging power factor a shunt capacitor is used to draw the leading the current than the voltage source. The net result is improvement in the power factor. Series inductive compensation: This method is used when there is low load or no load at the receiving end. Due to very low or no load, very low current flows through the transmission line.

Shunt capacitance in the transmission line causes Ferranti Effect. Such that the receiving voltage is doubles than the sending end voltage. To compensate these effect a shunt inductors are connected across the transmission

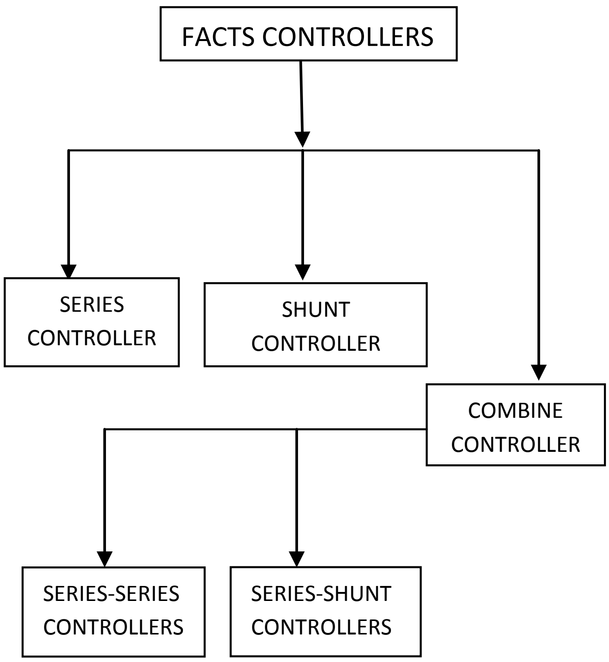

Fig. 1 Classification of FACTS devices

II. CLASSIFICATION OF FACTS DEVICES

2.1 Series controllers:

The series controller [5] could be variable impedance, such as capacitor, reactor, etc. The series controllers are injected to the transmission line in order to inject the voltage in series to the transmission line. The injected series voltage in the line can be represented by variable impedance multiplied by the current flow through it.

1.1 Shunt controller

Please Shunt controllers are used to inject current to the point where they are connected into the system. The variable shunt impedance of the shunt controller will vary the current flow in the respected line by injecting a current into the system.

1.2 Combine series series controller

Combined series-series controller: The combined series-series controller has two configurations one is series controllers operating in a coordinated manner in a multi line transmission system and the other configuration provides self-governing reactive power control and, at the similar time, provides real power transfer through the power link. An example of this type of controller is the Interline Power Flow Controller (IPFC), which is capable of balancing both the real and reactive power flows on the lines.

1.3 Combine series shunt controller

The combined series-shunt controller may have two configurations, one consists two separate series and shunt controllers that can operate in a coordinates manner and the other one being an interconnected series and shunt component. In each configuration, the shunt component inject a current into the system while the series component inject a series voltage. When these two elements are unified, a real power can be exchanged between them via the power link.

III. Thyristor Switched Reactor (TSR)

A shunt connected, thyristor-switched inductor whose effective reactance is varied in a stepwise manner by full- or zero conduction operation of the thyristor valve.

This method is used either when charging the transmission line, or, when there is very low load at the receiving end. Due to very low or no load a very low current flows through the transmission line. Shunt capacitance in the transmission line cause Ferranti Effect. The receiving end voltage may become double the sending end voltage (generally in case of very long transmission lines). To compensate, shunt inductors are connected across the transmission line. The lead time between the zero voltage pulse and zero current pulse duly generated by suitable operational amplifier circuits in comparator mode are fed to two interrupt pins of the microcontroller where the program takes over to actuate appropriate number of opto-isolators interfaced to back to back SCRs at its output for bring shunt reactors into the load circuit to get the voltage duly compensated. The microcontroller used in the project is of 8051 family which is of 8 bit.

The power supply consists of a step down transformer 230/12V, which steps down the voltage to 12V AC. This is improved to DC using a Bridge rectifier. The ripples are removed using a capacitive filter and it is then regulated to +5V using a voltage regulator 7805 which is required for the operation of the microcontroller and other components.

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REFERENCES

[1] Tan.Y.L, "Analysis of line compensation by shunt connected FACTS controllers: A Comparison between SVC and STATCOM', IEEE Power Eng, 1999, 19, (8)..

[2] N. Kumar, A. Ghosh, R.K. Verma, "A novel placement strategy for FACTS controllers", IEEE Trans. on Power Delivery, Vol. 18, No. 3, pp. 982-987]

[3] M..H. Hague, 2000; "Optimal location of shunt facts device in long transmission line" IEEE Proceedings on generation transmission & distribution, Vol. 147, No.4, pp.218-22,200

[4] B. Singh, "Application of FACTS Controllers in power systems for enhance the power system stability: A state-of-the-Art", International Journal of Review in Computing, 15th July 2011, Vol.6, PP 40-68

[5] F.D.Galiana, K, Almeida, M.Torissaint, J.Griffin, D.Atanackovic, B.T.Ooin and D.Mcgills, "Assessment and Control of the Impact of FACT Devices on Power System Performance", IEEE transactions on Power Systems, Vol.11, No.4, 1996,

[6] J.J. Paserba, "How FACTS controllers Benefits AC Transmission System", Fellow IEEE.

[7] Priyanka Kathal, Arti Bhandakkar "Power flow control in power system using

FACTS device Thyristor Controlled Series Capacitor (TCSC): A Review", International Journal of Science and Research (IJSR),vol.2, issue.3, March 2013.

[8] Pavalos. S. Georgilakis and Peter. G. Vernados "Flexible AC Transmission System Controller: An evaluation", Materials Science Forum, vol.670, pp 399-406, Trans Tech Publications, 2011.

[9] Aswani Kumar and Charan Sekhar "DSM based congestion management in pool Electricity Markets with FACTS devices", in Science Direct on International Conference on Advances in Engineering, 2012

[10] Narain G. Hingorani, Laszlo Gyugyi , 1999,Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, Wiley -IEEEPress, December 1999. ISBN 978-0-7803-3455-7

[11] N.G. Hingorani, L. Gyugyi, Understanding FACTS, Concept and Technology of Flexible AC Transmission Systems, NewYork, Wiley, 2000.