MAT JOURNALS

Journal of Analog and Digital Communications
Volume 3 Issue 1

AdaptiveTCR Control of STATCOMfor Voltage Regulation

Jaydeep S. Sawakhande*, KomalS.Kininge,TruptiV. Hingangave, JyotsnaS. Sawant, Gajanan S.Bandare,Asst. Prof.Suryawanshi A. A.
Department of Electrical Engineering
Sharad Institute Technology Collage of Engineering, Yadrav(Ichalkarnji).
Email ID- sawakhandejaydeep14@gmail.com

Abstract

In recent days a better reduction of transmission related problem and study of FACTS devices connected in field with the problem of reactive power compensation is increased. FACTS devices provide an opportunity to block, by controlling active and reactive power flows as well as line voltages. We have found that the study of shunt operations of FACTS devices and how it helps in better operating under normal working condition is urgent need. To enable the voltage stability of power system, STATCOM provides fast response and efficient reactive power compensation. The adaptation is self governing, this gives the plug-and-play potential for STATCOM operation. STATCOM is mainly used for reactive power compensation on electric transmission. A STATCOM or static synchronous compensator or static compensator is a synchronizing device which is used on alternating current electricity transmission networks. In an actual transmission line Ferranti effect occurs. In Ferranti impact the collectors end voltage is more noteworthy than the senders end voltage which as a result makes framework hinder. By using microcontroller we can automatically control the receiving end voltage.

Keywords: *Load bank, STATCOM, Reactive power compensation, Voltage stability, Adaptive control.*

INTRODUCTION

Reactive power management and voltage control are the main aspects to supports reliability and smooth the way for profit-oriented transactions across transmission networks. In the AC power system, voltage is controlled by immersion of reactive power and managing production.

The Static Synchronous Compensator is a shunt connected reactive compensation device. By generating and absorbing reactive power maintain control of specific parameters of the electric power system. The STATCOM is designed such as to provide fast voltage control to enhance the stability of system. In a STATCOM there are two basic controls. First one is across the grid is the AC voltage regulation and another one is across the capacitor is the control of the DC voltage. To improving the security and reliability of power systems voltage stability is a critical consideration. In STATCOM performance controllers play a key factor to control the parameters or gains.

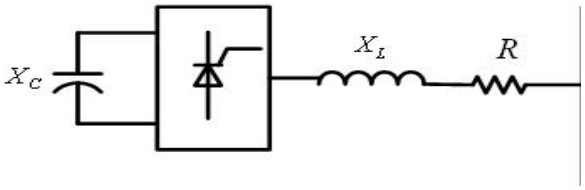


Fig 1: *STATCOM*

STATCOM resembles "Fitting and-play" gadget will make the STATCOM to be utilized as a part of different working conditions. It is a dynamic execution of the STATCOM.

Methodology

We use TCR based voltage regulation technique. This is done by varying PWM

signal to gate of triac with respective of receiving end voltage level.

In actual transmission line Ferranti effect occurs. In Ferranti effect the receiving end voltage is more than sending end voltage that causes system will be interrupt. By using microcontroller can automatically control the receiving end voltage.

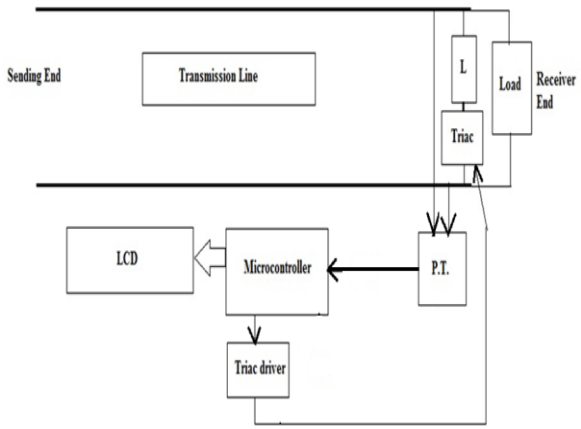


Fig 2.*Layout of transmission line.*

Above figure shows the layout of transmission line. In that potential transformer connected across transmission line. It is also connected to microcontroller used to sense the actual voltage on transmission line and receiving end voltage become display on LCD. After that microcontroller give signal to the triac through triac driver and this triac by using firing angle control inductive power and automatically control the receiving end voltage.

Components and its functions

Optocoupler Power supply regulators, Digital logic inputs, microprocessor input.

Microcontroller: It is 40 pins of PIC 16F877A controller used as I/O pins to read and write data from connected device as well as to connect external device with microcontroller.

Thyristor: It is a semiconductor device. Made with four layers be interspersed N and P-type materials. It acts exclusively as a switch, conducting when the gate receives a current trigger, and continuing to conduct while the voltage across the device is not reversed.

Triac: The triac is a three terminal semiconductor device. For controlling current triac is used. It is bidirectional.

Regulators: Regulator using converts the voltage from 12v to 5v.

Control model

Project hardware is implemented by using this circuit diagram. Controlling the voltage using different type of equipment and elements.

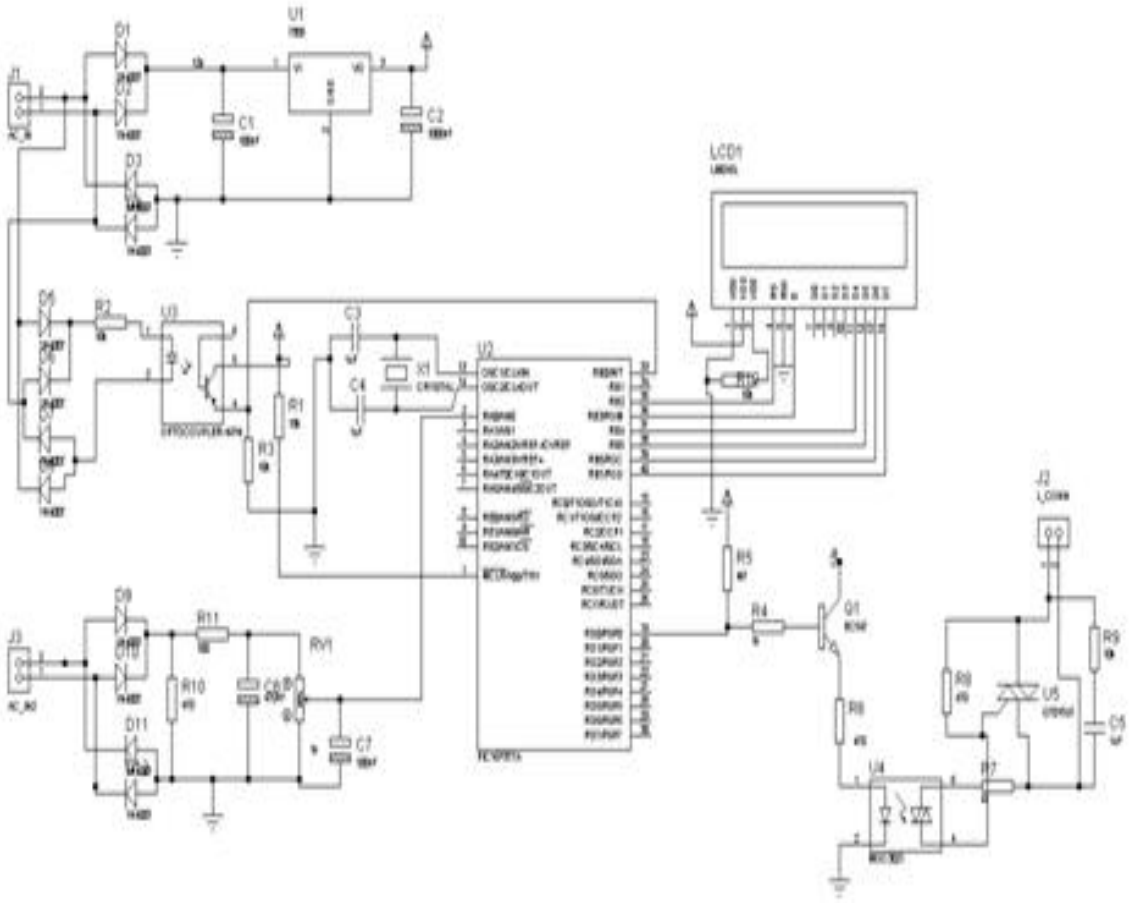
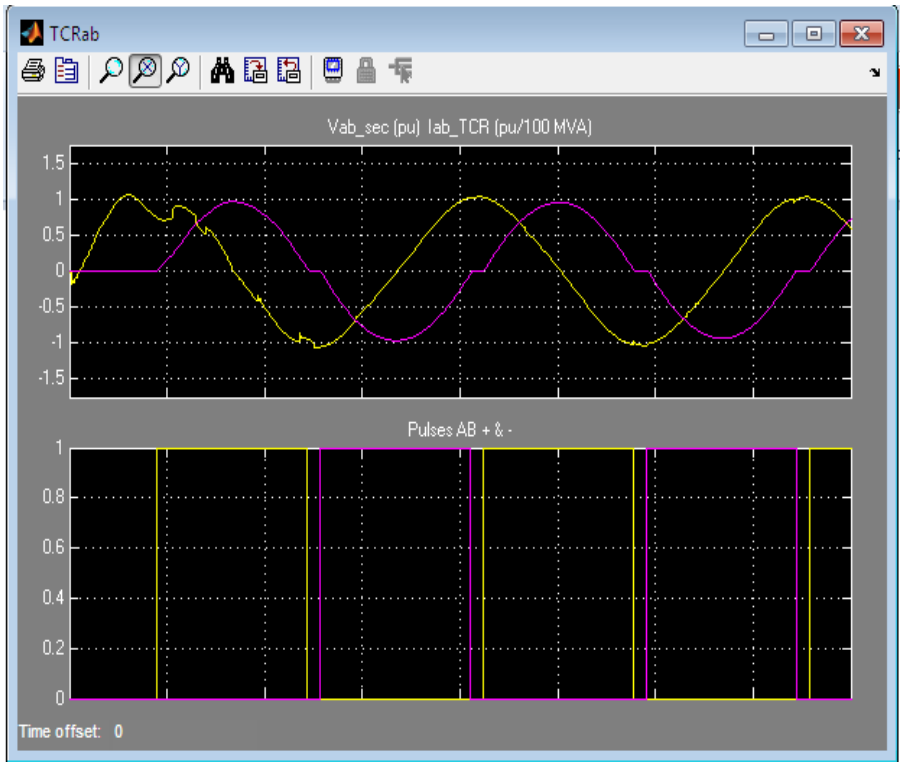


Fig 3. *Control Model*

RESULT



The reference voltage is 1.0 pu, the STATCOM is initially fluctuating (zero current). This operating point is obtained and TCR almost at full conduction.

At t=0.1s voltage is increased to 1.025 pu. At this point TCR is at full conduction (α = 94 degrees). To set the voltage to 1.01 pu by absorbing reactive power.

At t=0.4 s the source voltage is lowered to 0.93 pu. The TCR (α =120 degrees) generates reactive power, thus increasing the voltage to 0.974 pu.

CONCLUSION

To build the transmittable power in air conditioning framework has been utilize the receptive power remuneration. It is utilized as a part of FACTS for non direct load. The relentless state control transmission by controlling the voltage along the lines utilizing the settled and mechanical exchanged capacitor.

REFERENCES

1. Yao Xu, Fangxing Li.” Adaptive PI control of STATCOM for voltage regulation”. IEEE member.
2. Avneesh Kumar, Vishwakarma, Dhaneshwari Sahu. “Efficient voltage regulation in three Phase A.C. transmission lines using static VAR compensator” IEEE member.
3. N. Yuvaraj, B. Deepan, M. Muruganandam, S. Saravanan “STATCOM based of adaptive control technique to enhance voltage stability on power grid” IEEE member.
4. BilawalRattarMehran University of Engg. And Tech.”. Reactive power compensation using STATCOM”
5. N. G. Hingorani, L. Gyugyi, “Understanding FACTS concepts and Technology of flexible AC transmission systems”, New York. IEEE Press, 2000.
6. E. Acha, H. Ambriz Perez, Fuerte Esquivel, “Advanced SVC Models for Newton-Raphson Load Flow and Newton Optimal Power FlowStudies”, IEEE Transactions on Power Systems, Vol. 15(1), pp.129-136, 2000.
7. L. Cai, “Robust Coordinated Control of FACTS Devices in Large Power Systems”, a PhD Thesis, University of Duisburg, Germany, published by Logos Verlag Berlin, 2004.