Journal of Advanced Research in Microelectronics and VLSI
Volume 2, Issue 1 - 2020, Pg. No. 10-13
Peer Reviewed Journal

Article

ARM Regulator Established SVC Compensation and Power Factor Correction

Satpute Rahul Gangadhar[1], Palde Chandrakant Baban[2], Zanjare Akshay Kisan[3]

[1,2,3]Student, Department of Electrical Engineering, Mcoerc Nashik, Maharashtra, India.

I N F O

Corresponding Author:
Satpute Rahul Gangadhar, Department of Electrical Engineering, Mcoerc Nashik, Maharashtra, India.
E-mail Id:
555rahulsatpute@gmail.com
How to cite this article:
Gangadhar SR, Baban PC, Kisan ZA. Arm Regulator Established Svc Compensation and Power Factor Correction. *J Adv Res Microelec VLSI* 2020;2(1): 10-13.

Date of Submission: 2020-05-02
Date of Acceptance: 2020-05-16

A B S T R A C T

An active power factor corrector is a power electronic device that controls the volume of reactive power drawn by a load in order to obtain a power factor as close as possible to unity. In order to reduce the power losses and to intensification the stability and transmission efficiency of communication and distribution lines, power factor correction research has develop a hot topic. Numerous control approaches for passive and active PFC were suggested. The design and expansion of a single phase anti parallel SCR based Static VAR compensator for reactive power compensation and power factor correction using ARM (Advanced RISC Machine) micro-controlling chip. The ARM microcontroller determines the firing pulses for the SCR to compensate excessive reactive components, thus withdraw PF near to unity.

Keywords: Power Factor Correction, Reactive Power, Arm Microcontroller

Introduction

Power Factor Correction (PFC) circuits were familiarized in power systems to sinusoid ally shape the ac line current and to position it in phase with the ac line voltage. Electrical engineers elaborate with the generation, transmission, distribution and consumption of electrical power have an attention in the power factor of loads since of the energetic performance of manufacturing loads such as rolling mills, arc furnaces, traction loads and large fluctuating single-phase loads draw enthusiastically changing quantities of reactive power from the supply systems.

Power factors distress competences and costs for both the electrical power industry and the consumers. In adding to the augmented operating costs, reactive power can necessitate the usage of wiring, switches, circuit breakers, transformers and broadcast lines with higher current capacities, this requires superior, more luxurious power plant equipment, transmission lines, transformers, switches, etc. than would be essential for only real power distributed. The occurrence

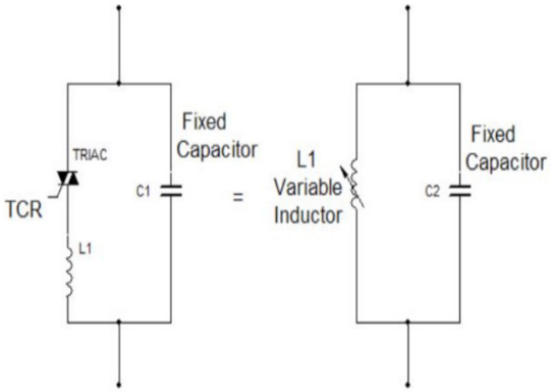


Figure 1.Equivalent Circuit of SVC

of reactive power therefore reasons the real power to be fewer than the apparent power and so, the electric load consumes a power factor of less than 1. Consequently, power companies necessitate their customers, particularly those with large loads, to preserve their power factors above a quantified amount (usually 0.90 or higher) or be issue to emolument supplementary responsibilities. Electricity

utilities consequently extent reactive power cast-off by great demand customers and charge advanced charges consequently. Particular consumers mount power factor correction arrangements at their factories to cut downcast on these higher costs. Power factor correction efforts to regulate the power factor of an AC load or an AC power transmission organization to unity (1.00) over numerous approaches. Table 1 list an amount of common loads seems in over-all industrial systems and their characteristic power factor.

Modest methods include switching in or out banks of capacitors. This technique of enhancing the power factor using capacitor banks is likewise named as static VAR compensator. Since reactive power generation is approved out complete switching in or out the capacitors to attain a preferred power factor at dissimilar load conditions. The switching action here is attained over and comprehensive with the mechanical switches and relays, which are listless, untrustworthy, require recurrent upkeep and make known to switching transients. It is too conceivable to practical power factor correction with a delivered synchronous motor connected across the supply. The power factor of the motor is diverse by regulating the field excitation and can be complete to perform like a capacitor when over enthusiastic. A capacitor bank provides power factor control in discrete steps where as synchronous motor provides a smooth control of power factor but they are not fast enough to compensate reactive power for rapid load changes due to large time constant of their field circuit and they have much higher losses. The simple correction methods designated above for power factor correction have certain of the difficulties such as dynamic VAR compensation, use of motorized switches and relays, not dissolute adequate for rapid load fluctuations and higher losses, so additional refined method must be castoff to precise for non-linear loads. Active power factor corrector is used for reactive power compensation. One of the new approaches for active power factor improvement is SCR based active power factor corrector to regulate the reactive power, this method of active power factor correction is characterized by continuous and static VAR control, low losses, redundancy, flexibility and provides the smooth control of flow of reactive power.

An enhanced power factor is the chief objective of this project. Expansion and application of a reliable, efficient and cost effective “Active Power Factor Corrector” comprising arm controller grounded hardware and companionable software which will be talented to control the power factor of both linear and nonlinear load. Idealy when current and voltage are in phase at that point power factor is solidarity and circuit is resistive in nature everywhere then.

At the point when load is inductive in nature then voltage and current are driving then we utilized SVC for power factor adjustment. Automatic power factor monitoring is done by using ARM (LPC2138) microcontroller. Then output of ARM(LPC2148) microcontroller given to the static VAR compensator. A static VAR compensator comprise of capacitor bank in four parallel consecutive strides with thyristor controlled reactor.

Literature Survey

Due to modern day expansion in the industrial sector the demand of the power takes been amplified extremely. There are more power demand arises due to the loads in industries. An electrical load can be classified in three categories and they are resistive load like filament lamp, capacitive load like motor starter circuit, Inductive load like motor, generator etc. The majority of load in industries are inductive in nature as appliance which are used in any industries are almost similar everywhere. Motor which are used in industries are one of the common used appliance in any industries. Motor load is inductive in nature. Due to inductive nature the current lags voltage, Hence due to the phase modification between voltage and current, the reactive power loss in the system proliferations. Due to which the efficiency of the system becomes poor and the power factor of the system gets decreased. Since of lower power factor, manufacturing gets stimulating penalty. Since conferring to the norms of Electrical Supply Company if the power factor enthusiasms below 0.97 lag they charge penalty. Power system theoretical basis and important parameters in power system as active power (P), apparent power (S) and reactive power (Q). Power triangle and power factor also be discussed. This paper also converses when low power factor, consumer partaking to recompense too considerable. Low power factor too is display that system is not efficient and will be power loss. Benefit or good correction power factor also be conversed. Over the process power factor development, demand for apparent power (S) and reactive power (Q) could be reduced to both generator and consumers. Lost electricity also could be reduced and system voltage can be increased.[1]

Control of voltage stability using understanding examination for reactive power allocation and support on voltage stability margin. The critical modes of voltage instability are intended by learning the system modes in the neighborhood of the point of collapse using Static Var Compensator. System contribution issues for the critical mode are castoff to control the utmost appropriate sites for system reinforcement. Modal examination of the adapted Jacobian matrix is cast-off to classify critical areas prone to voltage instability as well as the enlargement of remedial actions as well as the co-ordinated application of multiple FACTS controllers to progress steady state voltage stability to encompass the steady state voltage stability margins in

electric power systems.[2]

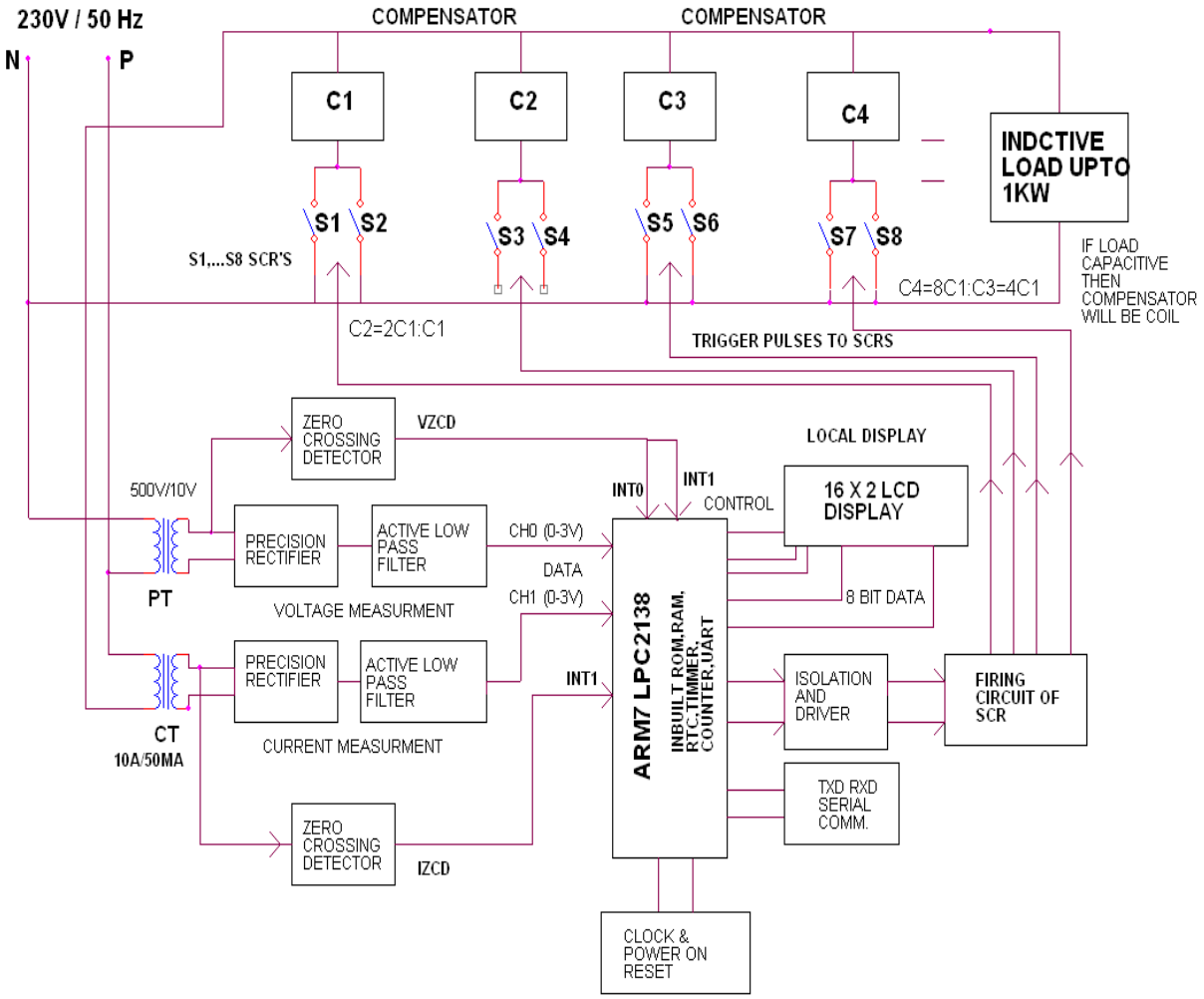
Causes of voltage instability and different types of voltage instability are also reviewed. Different static methods and dynamic simulation with suitable models for voltage stability and power factor correction assessments are proposed. Different techniques for voltage stability analysis are Modal analysis and Time-Domain analysis. FACTS strategies can advance the steadiness of network, such as the transient and the unimportant signal stability and can decrease the stress of profoundly loaded lines and support voltages by regulatory their parameters as well as series impedance, voltage and phase angle. Controlling the power flows in the network leads to diminish the stress of severely loaded lines, improved arrangement loadability, less system loss and enhanced security of the system.

The substances of fiction have been deliberated in the subsequent areas:

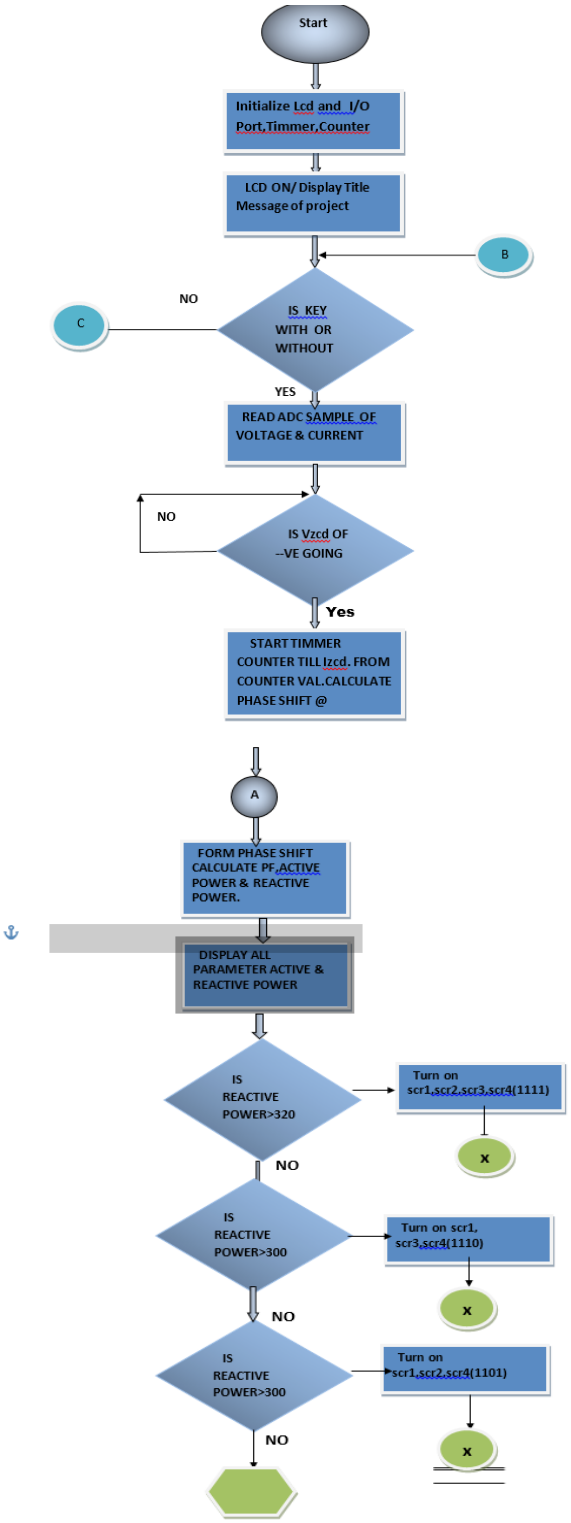
- Contingency Examination
- FACTS Controllers for Optimization of Power System
- Voltage Stability Catalogues for Optimization of Power System
- Optimization Methods

Contingency examination is an significant constituent of the security function, which is measured to be an essential part of the contemporary energy management system at energy control centers. Online steady state safety examination of electric power systems demands valuation of the belongings of a great number of generation unit and transmission line contingencies in order to assess the security of the system. A fast appraised method for resolving the AC power flow problematic for line and generator outages. The method is provocatively more precise than any linear estimate and meaningfully faster. The influences consume remained castoff to examine the post-outage voltages and reactive power output of the sources resulting outage of a transmission branch or a generator. The estimate of post-contingency voltages and reactive power age group and movements by means of compassions has been discoursed.[3]

Block Diagram



Flowchart



Conclusions

This paper clearly brings out review for designing and improvement of static VAR compensator, which is single phase and anti-parallel SCR based. This helps calculating reactive power compensation and power factor improvement. This involves the use of ARM (Advanced RISC Machine) micro-controlling chip. This ARM microcontroller regulates firing pulses for Scr to neutralize unnecessary reactive constituents, therefore take out PF near to unity.

Acknowledgement

With profound and respect, we express our sincere appreciation to our Project guide, Miss. Dhande D. P. whose systematic method of functioning has been our inspiration and we would also like to thank her for her valuable suggestions and guidance given in carrying out this project work which will be very helpful for us in future. We also like to thank for her timely and useful suggestions, which enable us to complete this project and enriching our knowledge, which will in turn enable us to become better engineers in future.

We would like to thank our Head of the Department, Mr. S. S. Khule, without whose support, we wouldn't have been able to complete this project work for Stage - I in time. We also acknowledge our sincere thanks to Prof. Dr. G. K. Kharate, Principal, MCOERC, Nashik, for providing me infrastructural facilities to work in, without which this work would not have been possible. We would also like to thank all the staff members for their kind support.

References

1. Sharma A, Nayyar V, Chatterji S et al. PIC Microcontroller Based SVC for Reactive Power Compensation and Power Factor Correction. *International Journal of Advanced Research in Computer Science and Software Engineering* (ISSN) 3(9): 650-656.
2. Bagwan SU, Mulla AM, Gudaru U. Performance Investigation of Static Var Compensator (SVC) With Thyristor Binary Compensator at 500 Kva Distribution Transformer. Proceedings of 11th IRAJ International Conference, Chennai, India. ISBN: 26-29,12th January 2014.
3. 2013Shih-Min Hsu, Student Member, IEEE Electrical and Computer Engineering Louisiana State University, Baton Rouge, "Reactive Power Compensator with Harmonic Blocking Feature", Proceedings of the 28th Southeastern Symposium on System Theory (SSST '96) 1996; 206-210.
4. Das S, Chatterjee D, Goswami SK. A GSA-Based Modified SVC Switching Scheme for Load Balancing and Source Power Factor Improvement. *IEEE Transaction on power delivery* 2016; 31(5): 2072-2082.
5. Saha S, Tyagi T, Gadre DV. ARM® Microcontroller based Automatic Power Factor Monitoring and Control System", Texas Instruments India Educators' Conference, 2013; 165-170.
6. Sharma A, Nayyar V, Chatterji S et al. PIC Microcontroller Based SVC for Reactive Power Compensation and Power Factor Correction'' Lehana et al., *International Journal of Advanced Research in Computer Science and Software Engineering* 2013; 3(9): 650-656.