



## MLI-HYBRID-STATCOM WITH WIDE COMPENSATION RANG AND LOW DC-LINK VOLTAGE

**R PAPI REDDY**  
ANURAG Engineering  
College Kodad  
rekkalapapireddy238@gm  
ail.com

**G.SATYANARAYANA**  
Assoc. Prof.  
Dept. of E.E.E  
Anurag Engineering  
College, Kodad.

**S CHANDRA SEKHAR**  
HOD Dept of EEE  
Anurag Engineering  
College,Kodad,TS

### ABSTRACT

*Proposes a cross breed static synchronous compensator (half breed STATCOM) in a three-stage power transmission system that has a wide remuneration range and low DC-interface voltage. In view of these noticeable qualities, the system expenses can be significantly lessened. In this paper, the circuit setup of mixture STATCOM is presented first. Its V-I trademark is then examined, talked about, and contrasted and conventional STATCOM and capacitive-coupled STATCOM (C-STATCOM). The system parameter configuration is then proposed on the premise of thought of the receptive power pay range and shirking of the potential reverberation issue. From that point forward, a control methodology for cross breed STATCOM is proposed to permit operation under various voltage and current conditions, for example, lopsided current, voltage plunge, and voltage blame. At long last, recreation and exploratory outcomes are given to confirm the wide remuneration range and low DC-interface voltage qualities and the great dynamic performance of the proposed half and half STATCOM.*

### 1.0 INTRODUCTION

THE substantial responsive current in transmission systems is a standout amongst the most widely recognized power issues that expands transmission misfortunes and brings down the strength of a power system. Utilization of responsive power compensators is one of the answers for this issue. Static VAR compensators (SVCs) are customarily used to powerfully remunerate receptive currents as the heaps fluctuate every now and then. Nonetheless, SVCs experience the ill effects of numerous issues, for example, reverberation issues, harmonic current infusion, and moderate reaction. To defeat these detriments, static synchronous compensators (STATCOMs) and dynamic power channels (APFs) were produced for

receptive current remuneration with speedier reaction, less harmonic current infusion, and better performance. In any case, the STATCOMs or APFs as a rule require multilevel structures in a medium-or high-voltage level transmission system to lessen the high-voltage worry over each power switch and DC-connect capacitor, which drives up the underlying and operational expenses of the system and furthermore expands the control unpredictability. Afterward, arrangement sort capacitive-coupled STATCOMs (C-STATCOMs) were proposed to lessen the system DC-interface working voltage prerequisite [10], and different arrangement sort crossover structures that comprise of various uninvolved power channels (PPFs) in arrangement with STATCOMs or APF structures (PPF-STATCOMs) have been connected to power dispersion systems and footing power systems

### SCOPE OF THE PROJECT

This venture proposes a half and half static synchronous compensator (cross breed STATCOM) in a three-stage power transmission system that has a wide pay range and low DC-interface voltage. In light of these noticeable qualities, the system expenses can be enormously lessened. In this paper, the circuit arrangement of cross breed STATCOM is presented first.

### EXISTING SYSTEM

SVCs experience the ill effects of numerous issues, for example, reverberation issues, harmonic current infusion, and moderate reaction. To defeat these drawbacks, static synchronous compensators (STATCOMs)

and dynamic power. Channels (APFs) were produced for receptive current pay with quicker reaction, less harmonic current infusion, and better performance.

## 2.0 LITERATURE SURVEY

**TITLE:** Reactive power compensation technologies: State-of-the-art review

**AUTHORS:** J. Dixon, L. Moran, J. Rodriguez, and R. Domke

**PUBLICATION:** IEEE, vol. 93, no. 12, pp. 2144–2164, Dec. 2005

This paper shows an outline of the best in class in responsive power pay advances. The standards of operation, outline qualities and application cases of Var compensators actualized with thyristors and self-commutated converters are exhibited. Static Var generators are utilized to enhance voltage control, soundness, and power factor in air conditioning transmission and dispersion systems. Illustrations got from significant applications portraying the utilization of receptive power compensators actualized with new static Var advances are additionally depicted.

**TITLE:** Assessing the performance of a static var compensator for an electric arc furnace,”

**AUTHORS:** T. J. Dionise

**PUBLICATION:** Trans. Ind. Appl., vol. 50, no. 3, pp. 1619–1629, Jun. 2014.a

The advantages of a Static VAR Compensator (SVC) for electric arc furnace (EAF) and ladle melt furnace (LMF) applications are well known. The SVC minimizes the impact of the EAF and LMF on the utility as well as improves the efficiency of both furnaces. In this application, it was desirable to quantify the performance of the SVC. This paper describes power quality measurements which were taken on the electrical distribution system to evaluate the performance of the SVC. The purpose of the power quality measurements was to monitor the voltage regulation, harmonics, flicker and other power quality quantities at the 138 kV utility point-of-common-coupling (PCC)

as well as the 34.5 kV system serving the SVC, EAF and LMF. The measurements and subsequent analysis established a baseline for the SVC performance and identified areas of concern. This paper describes the analysis of the measurements and evaluation of the SVC performance.

**TITLE:** Negative-sequence reactive-power control by a PWM STATCOM based on a modular multilevel cascade converter (MMCC-SDBC)

**AUTHORS:** M. Hagiwara, R. Maeda, and H. Akagi

**PUBLICATION:** IEEE Trans. Ind. Appl., vol. 48, no. 2, pp. 720–729, 2012.

This paper shows the use of a secluded multilevel course converter in view of single-delta connect cells (SDBC) to a STATIC synchronous COMPensator (STATCOM), especially for negative-arrangement receptive power control. The SDBC is portrayed by course association of numerous single-stage H-extension (or full scaffold) converter cells per leg, in this way encouraging adaptable circuit configuration, low-voltage steps, and low-electromagnetic-obstruction discharges. This paper outlines, builds, and tests a 100-V 5-kVA pulsewidth-adjusted STATCOM in light of the SDBC, with concentrate on the working guideline and performance. Exploratory outcomes confirm that it can control positive-succession responsive power as well as negative-arrangement receptive power and low-recurrence dynamic power planned for glint pay of bend heaters.

**TITLE:** An improved hybrid DSATCOM topology to compensate reactive and nonlinear loads

**AUTHORS:** C. Kumar and M. Mishra

**PUBLICATION:** IEEE Trans. Ind. Electron., vol. 61, no. 12, pp. 6517–6527, Dec. 2014

This paper proposes an enhanced half and half circulation static compensator (DSTATCOM) topology to address some down to earth issues, for example, power rating, channel measure, pay performance,

and power misfortune. A  $\$LCL\$$  channel has been utilized at the front end of a voltage source inverter (VSI), which gives better exchanging harmonics disposal while utilizing significantly littler estimation of an inductor as contrasted and the customary  $\$L\$$  channel. A capacitor is utilized as a part of arrangement with a  $\$LCL\$$  channel to diminish the dc-connect voltage of the DSTATCOM. This therefore decreases the power rating of the VSI. With diminished dc-connect voltage, the voltage over the shunt capacitor of the  $\$LCL\$$  channel will be additionally less. It will lessen the power misfortunes in the damping resistor as contrasted and the conventional  $\$LCL\$$  channel with latent damping. In this way, the proposed DSTATCOM topology will have diminished weight, cost, rating, and size with enhanced effectiveness and current remuneration capacity contrasted and the conventional topology. A systematic strategy to outline the segments of the detached channel has been displayed. The adequacy of the proposed DSTATCOM topology over conventional topologies is approved through both recreation and test examines.

### 3.0 PROJECT DESCRIPTION

#### GENERAL

In this area, a control system for crossover STATCOM is proposed by planning the control of the TCLC part and the dynamic inverter part with the goal that the two sections can supplement each other's hindrances and the general performance of mixture STATCOM can be moved forward. In particular, with the proposed controller, the reaction time of half breed STATCOM can be speedier than SVCs, and the dynamic inverter part can work at bring down dc-interface working voltage than the conventional STATCOMs. The control system of crossover STATCOM is isolated into two sections for exchange: A. TCLC part control and B. Dynamic inverter part control. The reaction time of cross breed STATCOM is examined to a limited extent

C. The control piece outline of half and half STATCOM.

#### 4.0 MODULES NAME

##### MODULE DESCRIPTION

##### STATCOM:

A static synchronous compensator (STATCOM), otherwise called a static synchronous condenser (STATCOM), is a managing gadget utilized on exchanging current power transmission networks. It depends on a power hardware voltage-source converter and can go about as either a source or sink of responsive AC power to a power network. On the off chance that associated with a wellspring of power it can likewise give dynamic AC power. It is an individual from the FACTS group of gadgets. It is naturally particular and electable.

##### FACTS

Versatile AC Transmission Systems, called FACTS, got in the late years a most likely comprehended term for higher controllability in power systems by technique for power electronic devices. A couple of FACTS-devices have been displayed for various applications around the globe. Different new sorts of contraptions are in the period of being introduced eventually. In most of the applications the controllability is used to evade taken a toll concentrated or scene requiring expansions of power systems, for case like overhauls or increments of substations and power lines. Facts devices give a better change than contrasting operational conditions and improve the usage of existing foundations. The crucial employments of FACTS-contraptions are:

- Power stream control,
- Increment of transmission capacity,
- Voltage control,
- Receptive power compensation,
- Soundness change,
- Power quality change,
- Power forming,
- Glint alleviation,

Interconnection of inexhaustible and scattered time and reserves.

Figure shows the key idea of FACTS for transmission systems. The utilization of lines for dynamic power transmission should be ideally up to beyond what many would consider possible. Voltage and strength cutoff focuses ought to be moved with the strategy for the couple of exceptional FACTS contraptions. It can be seen that with creating line length, the open entryway for FACTS contraptions gets more objective.

### SIMULATION THEORY

MATLAB (lattice research center) is a numerical processing condition and fourth-era programming dialect. Created by Math Works, MATLAB permits grid controls, plotting of capacities and information, usage of algorithms, formation of UIs, and interfacing with programs written in different dialects, including C, C++, Java, and Fortran. In spite of the fact that MATLAB is expected fundamentally for numerical figuring, a discretionary tool stash utilizes the MuPAD representative motor, enabling access to emblematic processing capacities. An extra bundle, Simulink, includes graphical multi-area reenactment and Model-Based Design for dynamic and inserted systems.

In 2004, MATLAB had around one million clients crosswise over industry and the scholarly world. MATLAB clients originate from different foundations of building, science, and financial matters. MATLAB is generally utilized as a part of scholarly and research foundations and in addition mechanical endeavors.

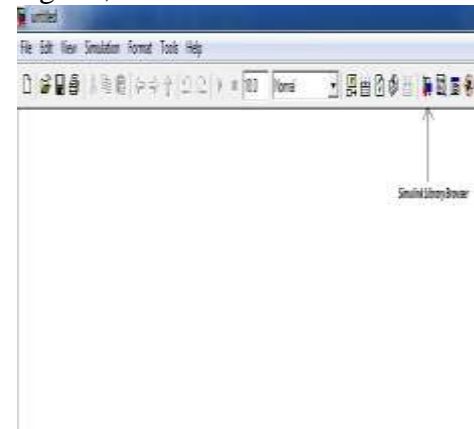
### MATLAB HISTORY

Cleve Moler, the executive of the software engineering office at the University of New Mexico, began creating MATLAB in the late 1970s. He planned it to give his understudies access to LINPACK and EISPACK without them learning Fortran. It soon spread to different colleges and found a solid gathering of people inside the

connected science group. Jack Little, a specialist, was presented to it amid a visit Moler made to Stanford University in 1983. Perceiving its business potential, he joined with Moler and Steve Bangert. They changed MATLAB in C and established MathWorks in 1984 to proceed with its improvement. These modified libraries were known as JACKPAC. In 2000, MATLAB was reworked to utilize a more up to date set of libraries for grid control, LAPACK.

### Selecting Blocks

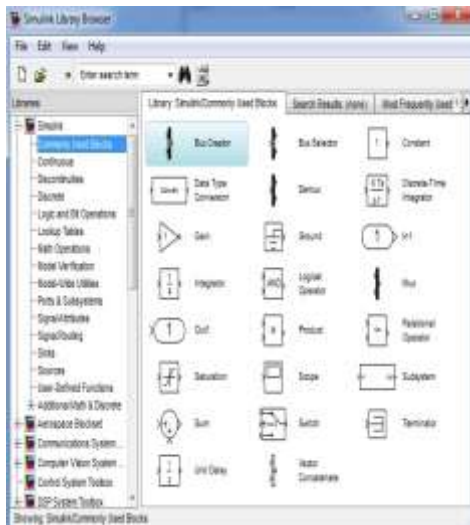
The Simulink Library Browser contains a library of pieces generally used to demonstrate a system. As appeared in Fig.4.2, these include:



### Building a new model

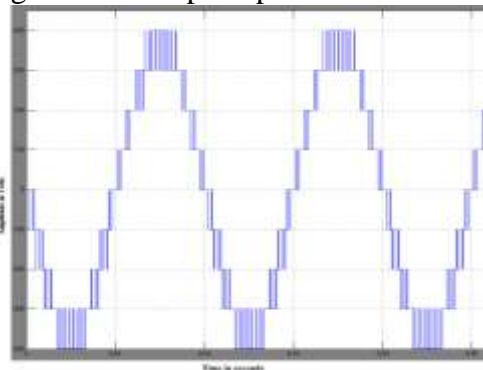
- Continuous and discrete progression squares, for example, Integration and Unit Delay
- Algorithmic pieces, for example, Sum, Product, and Lookup Table
- Structural pieces, for example, Mux, Switch, and Bus Selector

We can construct tweaked works by utilizing these pieces or by fusing manually written MATLAB, C, Fortran, or Ada code into the model. The custom pieces can be put away in their own libraries inside the Simulink Library Browser.



**Commonly used blocks**

MATLAB workspace to see and investigate the information utilizing MATLAB algorithms and perception devices



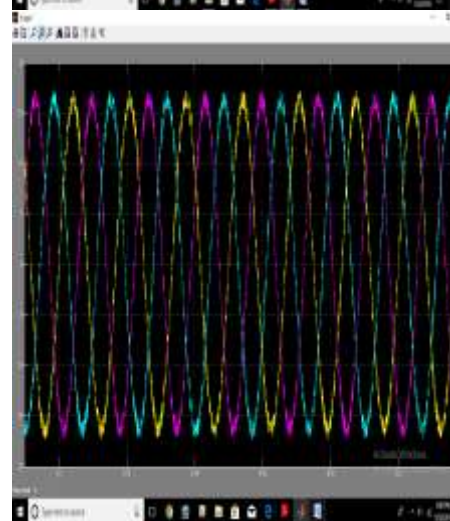
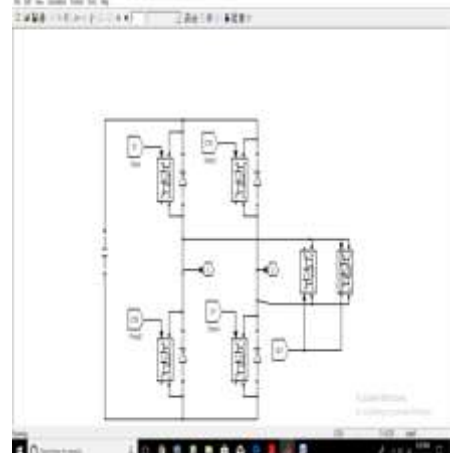
**Multi-step waveform**

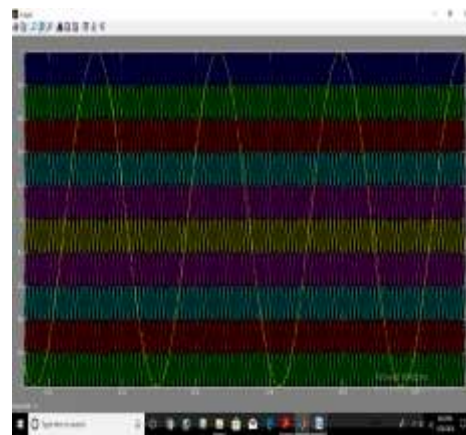
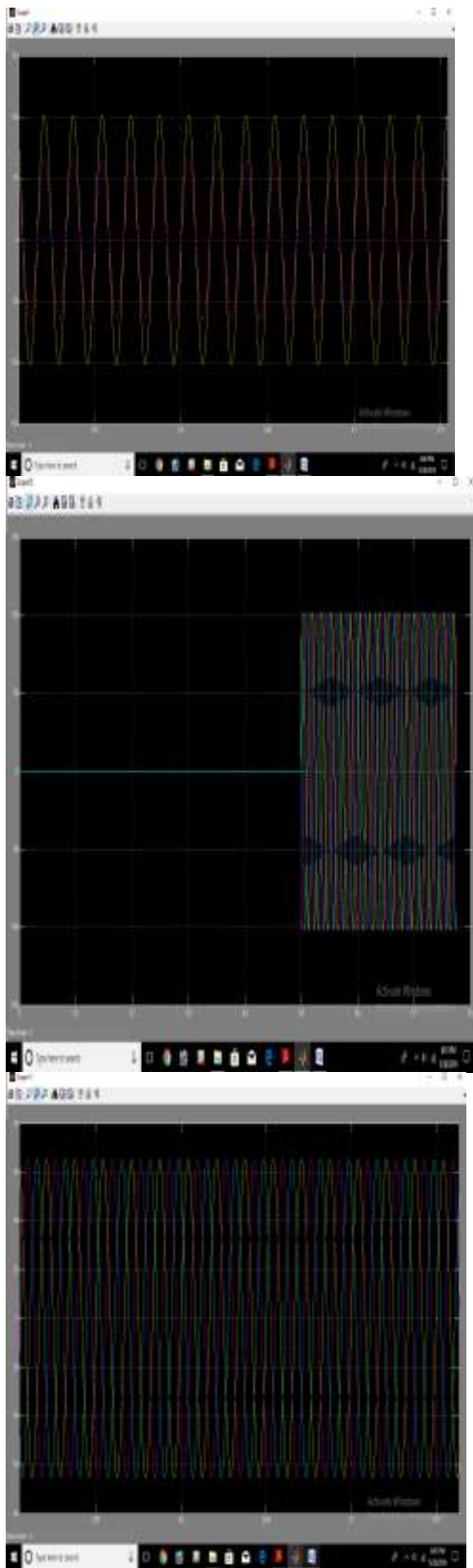
**5.0 SIMULATION RESULTS**  
**TECHNIQUES USED**

- **THD (Total Harmonic Distortion)**
- **POWER FACTOR**

**TECHNIQUES DESCRIPTION**

Add up to harmonic mutilation (THD) is a complex and frequently befuddling idea to get a handle on. Be that as it may, when separated into the essential meanings of harmonics and mutilation, it turns out to be considerably simpler to get it. Presently envision that this heap will go up against one of two fundamental sorts: direct or nonlinear.





## 6.0 CONCLUSION

In this paper, a half breed STATCOM in three-stage power system is proposed and talked about as a practical receptive power compensator for medium voltage level application. The system arrangement and V-I normal for the half and half STATCOM are examined, talked about, and contrasted and conventional STATCOM and C-STATCOM. Moreover, its parameter outline technique is proposed on the premise of thought of the responsive power remuneration range and counteractive action of a potential reverberation issue. Also, the control technique of the cross breed STATCOM is produced under various voltage and current conditions. At long last, the wide remuneration range and low DC-interface voltage qualities with great dynamic performance of the half and half STATCOM are demonstrated by both reproduction and trial comes about

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**R PAPI REDDY**, H NO 16C11D5408, rekkalapapireddy238@gmail.com, B tech ANURAG Engineering college Kodad, M tech ANURAG Engineering college Kodad.



**G.SATYANARAYANA** I am working as Assoc. Prof.in E.E.E Dept., in Anurag Engineering College, Kodad. , B tech GITAM Vishakapatnam, M tech JNTU Ananthapur, Ph.D Acharya Nagarjuna University Guntur Dist,



**S CHANDRA SEK HAR**

received his B.Techdegree in electrical &electronics engineering from RVR&JC college of engineering Guntur in 2001, M.Tech (high voltage engineering )degree in electrical & electronics Engineering from university college of engineering jntu kakinada in 2004 . he is pursuing Ph.D at K L university . presently he is working as associate professor and Head Of The Department of EEE. He is presented a paper on MICRO GRID FAULT ANALYSIS in WSEAS International conference at INDONESIA On 7,8,9, MAY 2016 . He is guiding aboth under graduate and post graduate student projects .his area of interest includes Micro Grids, High voltage transmission and Power systems.

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