

Harmonic reduction in converter by using selective harmonic elimination technique

1. *Ajith.G* 2. *Dinesh Chandar.G* 3. *Gobinath.T* 4. *Manoj Prabahar .M*

E-Mail: dineshchandar28@gmail.com

UG Scholars, Department of EEE,

Nandha Engineering College (Autonomous), Erode.

5. *Prabhakaran.S, Professor, Department of EEE, Nandha Engineering College (Autonomous), Erode.*

Abstract:- This paper presents a technique to spot installation harmonics in period of time mistreatment signals obtained from grid connected power electronic converters. The projected harmonics estimation has potential applications in distributed energy systems; the theoretical and experimental analysis of the changed SEPIC device is given during this paper. The projected device operates in DCM. Because the device operates in DCM it acts as a voltage follower id est. the input current follows the input voltage. The voltage across the switch is reduced. Furthermore a digital management technique is employed to scale back the third harmonic input current distortion. Finally, 100W power issue correction circuit was developed with associate operational potency of ninety eight.

Index Terms- Potential electrical device, Current electrical device, SEPIC module. liquid crystal display show, ATMEGA-8, Protius 8, AVR studio.

1.INTRODUCTION

Single section AC-DC converters (rectifiers) square measure common in power provides that type interface between utility power offer and equipment connected to

them. Uncontrolled single section diode bridge rectifiers with output electrical phenomenon filter draw non-sinusoidal currents . This causes high input current doctor's degree and low input power issue that is harmful to utility power offer. Within the past passive filters consisting of passive filters consisting of Single section AC-DC converters (rectifiers) square measure common in power provides that type interface between utility power offer and equipment connected to them. Uncontrolled single section diode bridge rectifiers with output electrical phenomenon filter draw non-sinusoidal currents. This causes high input current doctor's degree and low input power issue that is harmful to utility power offer. Within the past passive filters consisting of huge L and C at the input was wont to cut back current distortion (THD) at the value of more power issue and potency reduction. With the event of power natural philosophy, active filtering techniques are wont to alleviate these issues. These enclosed harmonic current injection and use of DC-DC device between rectifier and cargo. The DC-DC device between rectifier and cargo has several potential configurations together with those of bridgeless configuration. Recently some

configurations and techniques square measure being investigated for input current switch by providing switch between supply and rectifier. to this point Boost, Buck, Buck-Boost and Ćuk configurations are investigated for single section rectifier input current switch. The rectifier with output filter electrical condenser is termed a standard AC-DC utility interface. The filter electrical condenser reduces the ripples gift within the output voltage. though a filter electrical condenser considerably suppresses the ripple from the output voltage, it introduces distortions within the input current and attracts current from the provision discontinuously briefly pulses. This introduces issues together with reduction of accessible power and raised loss. To study standard switch mode single section AC-DC device topologies at the input facet of the rectifier together with SEPIC, Inverse SEPIC and letter topologies for AC-DC conversion with high input PF, low input current THD and high potency, to enhance the full harmonic distortion (THD) of single section rectifiers mistreatment switch mode topologies of Buck, Boost, Buck-Boost, Ćuk, SEPIC, Inverse SEPIC and alphabetic character converters at the input aspect of the rectifiers, Input current of controlled single section rectifiers are nearly curving and can be in section with input voltage. Absolute face bridge configuration are replaced so advantages can be available in handy like low physical phenomenon and shift losses so on. High performances are achieved i.e. high PF and potency similarly as low doctor's degree.

II. EXISTING SYSTEM

In existing system, harmonics reduction is finished by victimization harmonics compensation techniques implementing PI controller. it's not adaptative management, thus error answer

won't be correct. there's no management technique for reactive power management.

BLOCK DIAGRAM

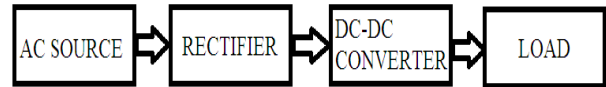


FIG 2.1 EXISTING BLOCK DIAGRAM

PROBLEMS OF CONVENTIONAL INTERFACE:

The large harmonic content and also the ensuing poor power issue (PF) of operation of the traditional rectifier--capacitor kind interface causes many issues to the utility provide. a number of them area unit listed below because of harmonic elements - as a result of the non-zero supply electrical resistance within the utility provide, the harmonic currents flowing through the traditional AC-DC utility interface can cause a distortion within the voltage wave shape at the purpose of common coupling. this could cause malfunction of facility protection, masses and metering devices. Besides voltage wave shape distortion, harmonic elements can also cause the issues of heating of neutral line, distribution transformers and distribution lines, interference with communication and management signals, over voltages because of resonance conditions. (2)Due to poor PF - Poor power issue of operation implies ineffective use of the var ratings of the utility instrumentation like transformers, distribution lines and generators. Also, it places a restriction on the whole instrumentation load which will be connected to a typical home or workplace wall-plug with specified most r.m.s current rating.

III. PROPOSED SYSTEM

In projected system, Selective Harmonic Elimination Pulse with Modulation is enforced therefore harmonics created is low. As a result of MLI harmonics compensation, harmonics are but a pair of in projected system and still as reactive power. Implementation of fuzzy controller can scale back the latency for harmonics and reactive power compensation but $2\mu s$.

BLOCK DIAGRAM

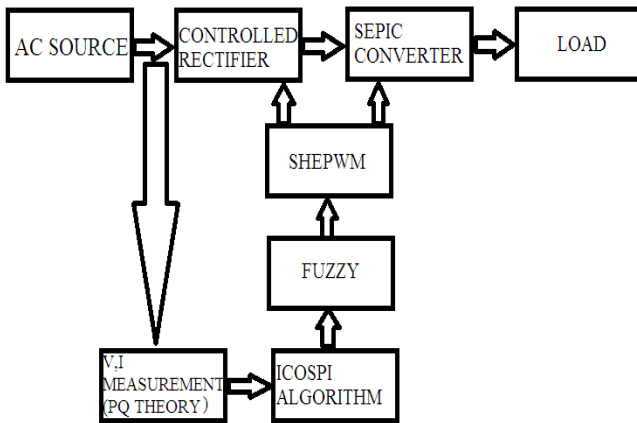


FIG 3.2 PROPOSED BLOCK DIAGRAM

In projected system, voltage and current feedback is 1st fed to reactive power and harmonics expert and once estimating it's given to fuzzy controller. Here, SHEPWM technique and structure electrical converter is employed for harmonics reduction and reactive power compensation.

SINGLE-ENDED PRIMARY INDUCTOR CONVERTER:

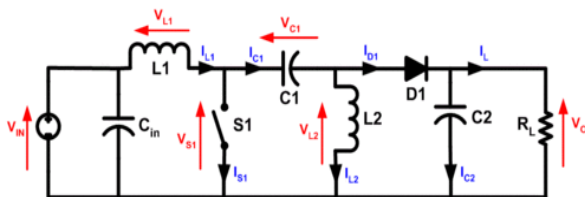


Fig3.3 Schematic of SEPIC.

The single-ended primary-inductor device (SEPIC) may be a variety of DC/DC device permitting the electrical potential (voltage) at its output to be bigger than, less than, or up to that at its input. The output of the SEPIC is management led by the duty cycle of the control electronic transistor. A SEPIC is basically a lift device followed by a buck-boost device, thus it's almost like a conventional buck-boost device, however has blessings of getting non-inverted output (the output has a similar voltage polarity because the input), employing a series electrical device to couple energy from the input to the output (and therefore will respond additional graciously to a short-circuit output), and being capable of true shutdown: once the switch is turned off, its output drops to zero V, following a reasonably hefty transient dump of charge.

SEPICs square measure helpful in applications within which electric battery voltage are often on top of and below that of the regulator's supposed output. for instance, one atomic number 3 particle battery generally discharges from four.2 volts three |to three} volts; if alternative elements need 3.3 volts, then the SEPIC would be effective. SEPICs are useful in applications in which a battery voltage can be above and below that of the regulator's intended output. For example, a single lithium ion battery typically discharges from 4.2 volts to 3 volts; if other components require 3.3 volts, then the SEPIC would be effective.

CIRCUIT OPERATION:

The schematic diagram for a basic SEPIC is shown in Figure one. Like alternative switched mode power provides (specifically DC-to-DC converters), the SEPIC exchanges energy between the capacitors and inductors so as to convert from one voltage to a different. The number of energy changed is controlled by switch S1, that is often a electronic transistor like a MOSFET. MOSFETs provide a lot of higher input resistivity and lower free fall than bipolar junction transistors (BJTs), and don't need biasing resistors as MOSFET change is controlled by variations in voltage instead of a current, like BJTs).

CONTINUOUS MODE

A SEPIC is alleged to be in continuous-conduction mode ("continuous mode") if the present through the electrical device L1 ne'er falls to zero. Throughout a SEPIC's steady-state operation, the common voltage across electrical device C1 (VC1) is adequate to the input voltage (Vin). as a result of electrical device C1 blocks electricity (DC), the common current through it (IC1) is zero, creating electrical device L2 the sole supply of DC load current. Therefore, the common current through electrical device L2 (IL2) is that the same because the average load current and thence freelance of the input voltage.

Looking at average voltages, the subsequent are often written: Because the common voltage of VC1 is adequate to VIN, VL1 = -VL2. For this reason, the 2 inductors are often wound on constant core. Since the voltages square measure constant in magnitude, their effects of the coefficient are going to be zero, presumptuous the polarity of the windings is correct. Also, since the voltages square measure constant in magnitude, the ripple currents from the 2 inductors are going to be equal in magnitude.

The average currents are often summed as follows (average electrical device currents should be zero):

once switch S1 is turned on, current IL1 will increase and therefore the current IL2 goes a lot of negative. (Mathematically, it decreases attributable to arrow direction.) The energy to extend the present IL1 comes from the input supply. Since S1 could be a moment closed, and therefore the instant voltage VC1 is closed.

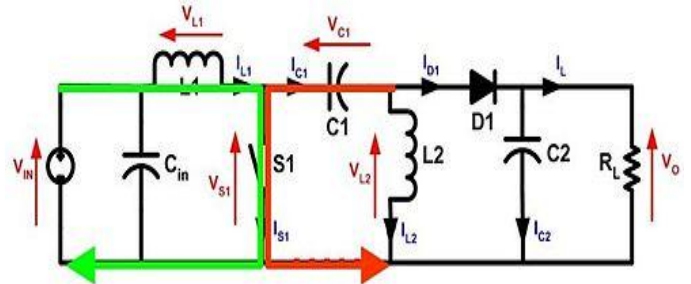


Figure 3.4: With S1 closed current increases through L1 (green) and C1 discharges increasing current in L2 (red)

When switch S1 is turned off, this IC1 becomes identical because the current IL1, since inductors don't enable instant changes in current. This IL2 can continue within the negative direction, actually it ne'er reverses direction. It may be seen from the diagram that a negative IL2 can increase this IL1 to extend this delivered to the load. Victimization Kirchhoff's Current Law, it may be shown that ID1 = IC1 - IL2. It will then be terminated, that whereas S1 is off, power is delivered to the load from each L2 and L1. C1, but is being charged by L1 throughout this off cycle, and can successively recharge L2 throughout the on cycle.

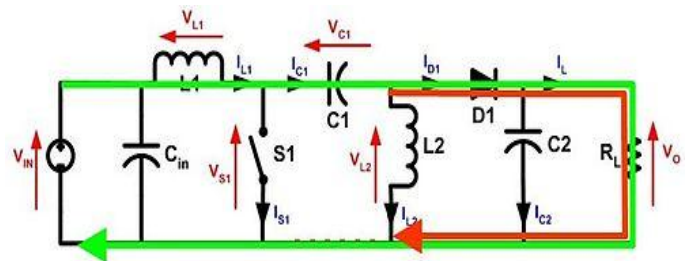


Figure: 3.5 With S1 open current through L1 (green) and current through L2 (red) produce current through the load

Because the potential (voltage) across electrical condenser C1 could reverse direction each cycle, a non-polarized electrical condenser ought to be used. However, a polarized Ta or electrical condenser is also utilized in some cases,[2] as a result of the potential (voltage) across electrical condenser C1 won't amendment unless the switch is closed long enough for a 0.5 cycle of resonance with electrical device L2, and by now this in electrical device L1 may well be quite giant. The electrical condenser CIN is needed to scale back the results of the parasitic inductance and internal resistance of the ability offer. The boost/buck capabilities of the SEPIC are doable as a result of electrical condenser C1 and electrical device L2. Electrical device L1 and switch S1 produce a customary boost device that generates a voltage (VS1) that's over VIN, whose magnitude is set by the duty cycle of the switch S1. Since the common voltage across C1 is VIN, the output voltage (VO) is VS1 - VIN. If VS1 is a smaller amount than double VIN, then the output voltage are but the input voltage. If VS1 is bigger than double VIN, then the output voltage are bigger than the input voltage.

The evolution of switched-power provides may be seen by coupling the 2 inductors in a very SEPIC device along, that begins to match a Fly back device, the foremost basic of the transformer-isolated SMPS topologies.

DISCONTINUOUS MODE:

A SEPIC is alleged to be in discontinuous-conduction mode or discontinuous mode if this through the inductance L1 is allowed to fall to zero.

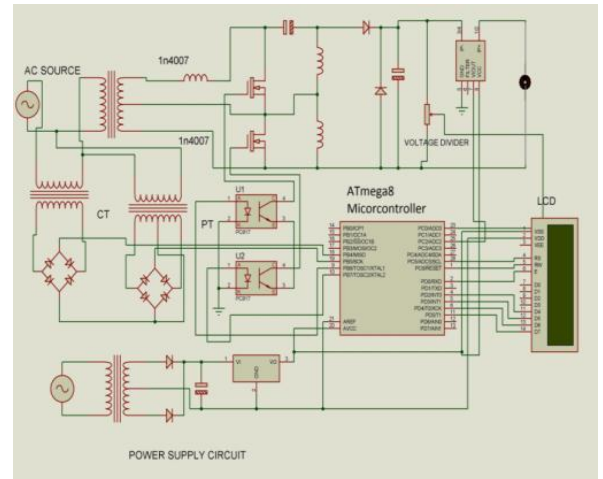


FIG 3.6 PROPOSED CIRCUIT DIAGRAM

A SEPIC may be a form of DC-DC device permitting the electrical potential (voltage) at its output to be but, larger than, or capable that at its input; the output of the SEPIC is management led by the duty cycle of the control semiconductor. SEPIC is effectively a lift device followed by a buck-boost device, consequently it's wish to a traditional buck-boost device, apart from has blessings of getting non-inverted output (the output has a similar voltage polarity because the input), passing through a series electrical condenser to couple energy from the input to the output (and so will respond additional graciously to a short-circuit output), and having the ability of factual shutdown: when the switch S1 is turned off, its output drops to zero V, following a rather hefty transient abandon of charge. SEPICs area unit useful in applications within which A battery voltage may be higher than and below that of the regulator's meant output The schematic diagram for a basic SEPIC is shown in Figure three like different switched mode power provides (specifically DC-to-DC converters), the SEPIC interactions energy between the capacitors and inductors so as to convert from one voltage to a different. The number of energy changed is in switch S1, that is classically a semiconductor like a MOSFET. MOSFET offers abundant higher input electric resistance and lower free fall than bipolar junction transistors (BJTs), and don't need biasing resistors as MOSFET switch is controlled by

microcontroller. Liquid crystal {display/LCD|digital display |alphanumeric display} is employed to display harmonics level. Here optocoupler U1, U2 is employed for MOSFET driver circuit.

IV. RESULTS AND DISCUSSION

The experiments were conducted to judge the performance of the planned methodology. The results bestowed during this paper mark the start of our efforts to create a Harmonic Reduction. Power issue correction has embrace for input power potency Icospi rule has influencing during this system for compensate the Harmonics its terribly correct and quick response therefore harmonics is lower than two SHEPWM is employed to cut back harmonic losses in MLI.

V. CONCLUSION

The harmonic minimization shapes the input current of off-line power provides to maximize the power offered from the mains. Ideally, the electrical appliance ought to gift a load that features a pure electrical device, so the reactive power drawn by the device is zero. The input current harmonics square measure absent, the input current could be a good duplicate of input voltage (sine wave). This drawn from the mains is at a minimum for the power needed to perform the required work, and this minimizes losses and value associated. The liberty from harmonics additionally minimizes interference with alternative devices being high-powered from constant supply.

REFERENCES

- [1] B. Singh, B. N. Singh, A. Chandra, and K. Al-Haddad, A. Pandey, D. P. Kothari, "A review of single-phase improved power quality AC-DC converters", *IEEE Transactions on Industrial Electronics*, Vol. 50, No. 5, Oct. 2003, pp 962 – 981.
- [2] O. Garcia, J. A. Cobos, R. Prieto, P. Alou, and J. Uceda, "Single Phase Power Factor Correction: A Survey", *IEEE Transactions on Power Electronics*, Vol. 18, No. 3, May 2003, pp. 749-755.
- [3] H. Wei and I. Batarseh, "Comparison of Basic Converter Topologies for Power Factor Correction," in *Proceeding Southeastcon'98*, 1998, pp. 348-353.
- [4] J. Salmon, "Techniques for minimizing the input current distortion of current-controlled single-phase boost rectifiers", *IEEE Tran. on Power Electronics*, 1993, pp. 509–520.
- [5] R. Erickson and M. Madigan, "Design of a simple high- power-factor rectifier based on the flyback converter", *IEEE applied power electronics conference (APEC)*, 1990, pp. 792–801.
- [6] D. Tollik and A. Pietkiewicz, "Comparative Analysis of 1-Phase Active Power Factor Correction Topologies," in *Proc. Int. Telecommunication Energy Conference*, Washington DC, USA, Oct. 1992, pp. 517-523.
- [7] O. L'opez, L. Vicuña, M. Castilla, J. Matas, and M. L'opez, "Sliding- Mode-Control Design of a High-Power-Factor Buck–Boost Rectifier" *IEEE Transactions on Industrial Electronics*, Vol. 46, No. 3, Jun 1999, pp. 604 – 612.
- [8] M. S. Patil, and S. P. Patil, "Single-Phase Buck-Type Power Factor Corrector with Lower Harmonic Contents in Compliance with IEC 61000-3-2" *International Journal of Engineering Science and Technology*, Vol. 2(11), 2010, pp. 6122- 6130
- [9] M. Brkovic and S. Cuk, "Input current shaper using Cuk converter", *14th International Telecommunications Energy Conference, INTELEC'92*, Oct. 1992, pp. 532- 539.
- [10] P. F. Melo, R. Gules, E. F. R. Romaneli, and R. C. Annunziato, "A Modified SEPIC Converter for High-Power-Factor Rectifier and Universal Input Voltage Applications", *IEEE Transactions on Power Electronics*, Vol. 25, No. 2, Feb 2010, pp. 310-321.
- [11] D. Maksimovic, J. Yungtaek, and R. Erickson, "Nonlinear-Carrier Control for High Power Factor Boost Rectifiers", *Applied Power Electronics Conference and Exposition*, Dallas, Texas, USA, Vol. 2, March 1995, pp. 635-641.
- [12] T. Tanitteerapan and E.Thanpo, "Negative Slope Ramp Carrier Control for High Power Factor Boost

Converters in CCM Operation”, *World Academy of Science, Engineering and Technology*, 2009, pp. 1084-1089.

[13] M. Kazerani, P. D. Ziogas and G. Joos, “A Novel Active Current Wave Shaping Technique for Solid-State Input Power Factor Conditioners”, *IEEE Trans. on Industrial Electronics*, Vol. 38, No.1, Feb. 1991, pp.72-78.

[14] L. Huber, Y. Jang, and M. Jovanovic, “Performance Evaluation of Bridgeless PFC Boost Rectifiers,” *IEEE Trans. on Power Electronics*, Vol. 23, No. 3, May 2008, pp. 1381–1390.