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Design and Analysis of Single Phase to Three Phase Drive System Based on Two Parallel Converters

CH.MOUNIKA

B Tech Student
 Dept of EEE
 SVS Institute of Technology
 Warangal, T.S, India

P.SRIREKHA

B Tech Student
 Dept of EEE
 SVS Institute of Technology
 Warangal, T.S, India

T.RAHUL

B Tech Student
 Dept of EEE
 SVS Institute of Technology
 Warangal, T.S, India

R.NAVEEN KUMAR

B Tech Student
 Dept of EEE
 SVS Institute of Technology
 Warangal, T.S, India

CH.VAMSHI

B Tech Student
 Dept of EEE
 SVS Institute of Technology
 Warangal, T.S, India

K.JAGANNATH

Guide
 Dept of EEE
 SVS Institute of Technology
 Warangal, T.S, India

Abstract: Single-stage to three-stage power transformation utilizing power hardware converters is a surely understood innovation, when the setups and control procedures effectively refined in the specialized study are considered. This paper presents single-stage to three-stage with dc-join converters with parallel rectifier and arrangement inverter for lessening in the information current and diminishment of the yield voltage handled by the rectifier circuit and inverter circuit separately. In this paper we proposed better answer for single stage to three stage drive framework by utilizing 2 parallel single stage rectifier arranges, a 3-stage inverter stage. Parallel converters can be utilized to enhance the force ability, unwavering quality, proficiency and repetition. A separation transformer is not utilized for the decrease of flowing streams among various converter stages. It is a vital goal in the framework outline. The complete correlation between the exhaustive model of proposed converter and standard designs will be exhibited in this work. Reenactment of this model will be done by utilizing MATLAB/Simulink.

Keywords: Power conversion, power electronics converters, parallel converter, pulse width modulation, three phase ac motordrive.

INTRODUCTION

Uninterruptible Power Supplies (UPS's) are these days fundamental hardware in supplying energy to basic and touchy burdens. They secure touchy burdens against numerous current unsettling influences in utility system such as voltage varieties, homeless people and music. Utilizations of UPS frameworks incorporate therapeutic offices, life supporting frameworks, server farms, crisis hardware, information transfers and modern preparing frameworks.

IEC-62040-3 standard arranges UPS's as uninvolved standby, line-intelligent and twofold transformation (on-line UPS). Every topology has its own particular qualities and is utilized in light of the heap prerequisites and the seriousness and kind of system unsettling influences [2].

The fundamental focal points of an inactive standby UPS are its configuration, minimal effort and little size. The line molding is detached which makes this topology genuinely powerful. Then again, rather long exchanging time in the middle of standby and reinforcement modes is the fundamental impediment of this topology

molding amid typical mode on the grounds that the inverter is not associated in arrangement with the heap [3], [4].

The twofold change or on-line topology is considered as the predominant topology in execution, and is generally utilized as standard answer for securing delicate burdens. Be that as it may, it has lower productivity when contrasted with different topologies because of two change stages in its structure. At the end of the day, power move through the rectifier and inverter notwithstanding amid the standby mode implies higher force misfortunes and lower effectiveness contrasted with aloof standby and line-intuitive UPS frameworks.

Another essential element of the online topology is the decoupling of the information from the yield, which permits changing over single-stage to three-stage UPS [5].

Diminishing the quantity of switches brings a standout amongst the most noteworthy cost decreases. Another technique for cost diminishment is supplanting dynamic switches, for example, MOSFETs, IGBTs and thyristors with diodes. Diodes are less expensive than dynamic switches, as well as cost lessening from killing entryway drivers for dynamic switches. Supplanting dynamic switches

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with diodes for the most part entangles circuit topology and lessens degrees of flexibility in the control framework. Along these lines, the control is generally more complex [5].

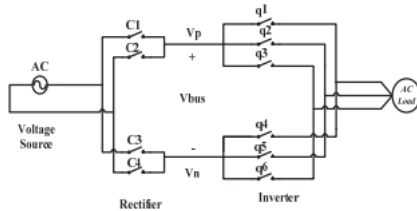


Fig. 1: A typical dual bridge single phase to three phase converter topology.

In this paper, after a brief presentation of a few topologies, diminished number of switches is concentrated on. The idea of using so as to decrease the expense of converters is connected four-switch three-stage DC/AC inverter rather than six switch three-stage DC/AC topology, yet with comparative usefulness. Moreover, the expense of the proposed UPS framework is lessened further by utilizing a novel singlephase AC/DC rectifier topology with only one switch and four diodes. Additionally an adjusting control of the nonpartisan voltage in the dc connection is connected for the symmetrical yield voltage of the DC/AC converter. At long last, reenactment results are given to approve its operation.

FAULT COMPENSATION

The proposed framework presents here excess of the rectifier converter, that can be valuable in particularly a shortcoming tolerant frameworks. We eyewitness that proposed framework can helps for pay for open-circuit and short out disappointments that happens particularly in the rectifier or inverter converter gadgets.

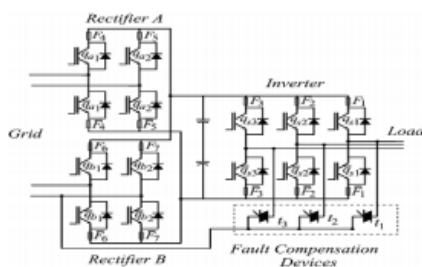


Fig. 2 Proposed configuration highlighting devices of fault-tolerant system

It likewise is by all accounts issue pay is incredibly accomplished by taking so as to reconfiguring the force converter topology help of segregating gadgets (fastactive breakers— F_j , $j=1, \dots, 7$) and associating gadgets (backto-back associated SCRs— t_1, t_2, t_3), as saw in Fig. 3

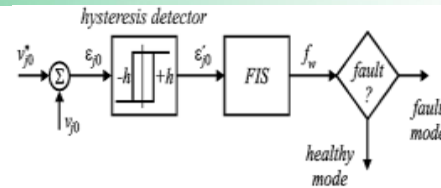
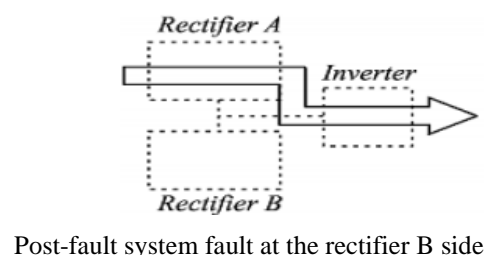
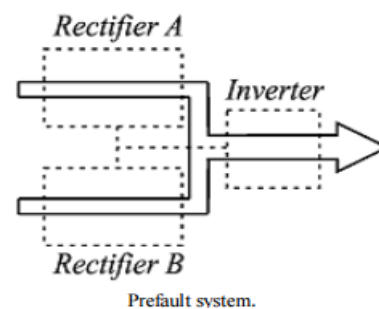


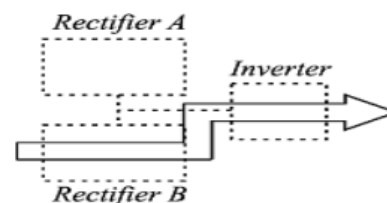
Fig. 3 Block diagram of the fault diagnosis system

In this figure 4, block fault identification system (FIS) detects as well as finds exact location of the faulty switches, by defining the leg that is to be isolated from the unit . which is based on the analysis of the pole voltage error. The fault detection as well as identification is considered in below four steps:

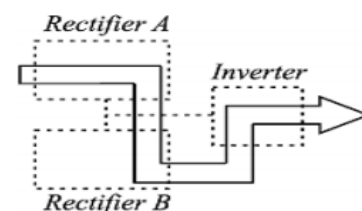
- 1) Taking the measurement of pole voltages
- 2) Computation of the error voltage by comparison with the acquired reference voltages and previously affected measurements in previous Step1);
- 3) determination is to be done whether errors matches or not to be considered to faulty condition; which can be implemented by the hysteresis detector.
- 4) identification of the faulty switches



Post-fault system fault at the rectifier B side



Post-fault system fault at the rectifier A side



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Post-fault system fault at the inverter side

Fig. 4 Possibilities of configurations in terms of fault occurrence.

Along these lines, four potential outcomes of setups have been considered as far as deficiencies: 1) pre-shortcoming ("solid") nature 2) post-flaw operation with issue at the rectifier B side post-issue operation with issue at the rectifier A side 4) post-issue operation with issue at the inverter side.

METHODS TO CONNECT SINGLE PHASE TO THREE PHASE DRIVE SYSTEMS

3.1 Static Phase Converter:

Static Phase Converters work by charging and releasing capacitors to incidentally deliver a third period of force for just a matter of seconds amid startup of electric engines, then it will drop out compelling the engine to keep on running on only 1 stage and just piece of its windings. Because of their innovation, Static Phase Converters don't appropriately control any class of 3 stage hardware or gear. They won't in any capacity power 3 stage welders, 3 stage battery chargers, 3 stage lasers, or any kind of apparatus with 3 stage hardware. Static Phase Converters additionally won't begin delta wound 3 stage engines.

3.2 Rotary phase converter:

A rotating stage converter, curtailed RPC, is an electrical machine that delivers three-stage electric force from single-stage electric force. This permits three stage burdens to run utilizing generator or utility-supplied single-stage electric force. A rotational stage converter might be worked as an engine generator set. These have the point of interest that in segregating the produced three-stage power from the single stage supply and adjusting the three-stage yield. In any case, because of weight, expense, and productivity concerns, most RPCs are not manufactured along these lines. Rotational Phase Converters Provide Reliable, Balanced, and Efficient Three Phase Power. Brisk and Effective Three Phase Electricity. All converters can be essentially arranged into two gatherings: one is course sort and another is bound together sort [2].

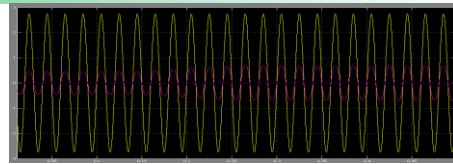
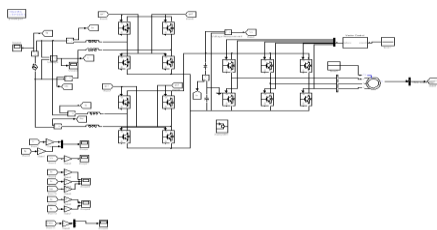


Fig12a

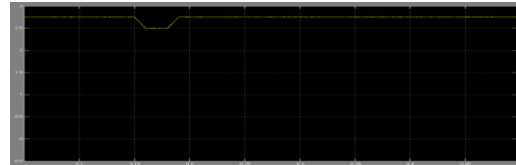


Fig12b

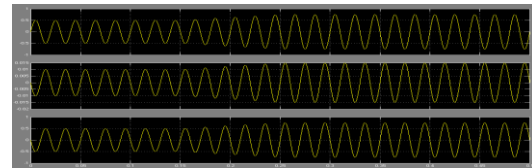


Fig12c

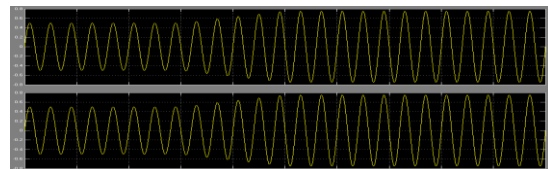


Fig12d

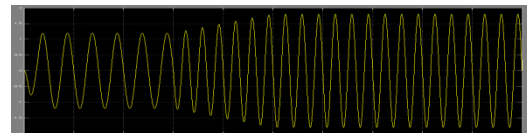
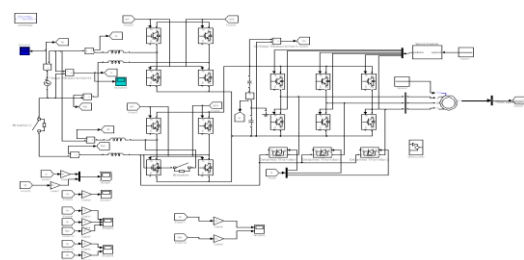
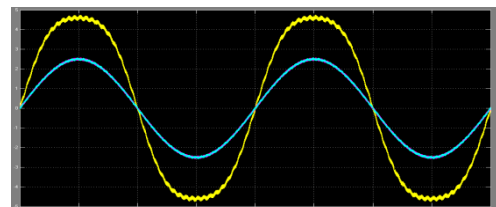
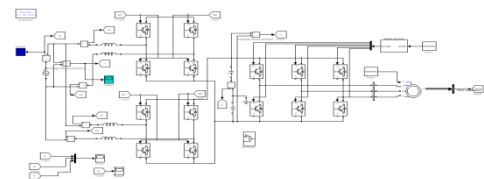
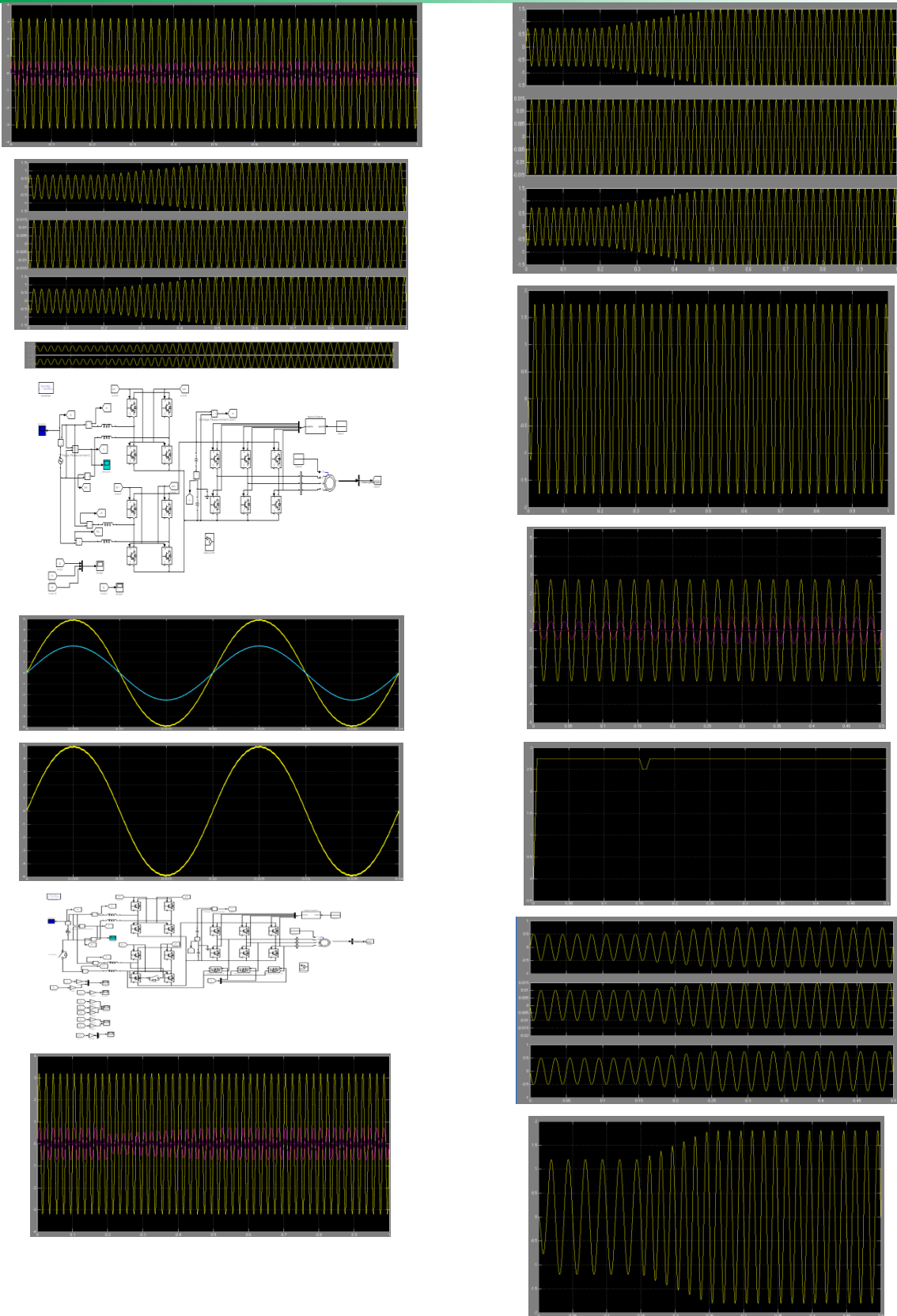


Fig12e



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CONCLUSION

A single-phase to three-phase drive converter composed of two parallel single-phase rectifiers and a three-phase inverter was proposed successfully with practical results. Here the framework consolidates in parallel two rectifiers without utilization of transformers, and it is advanced when the heap recurrence is equivalent to that of matrix voltage. The framework model and the control methodology, including the PWM strategy, have been produced. The proposed topology permits to reduce the current and consequently to reduce the power ratings of the power switches of the rectifier. Finally a Matlab/Simulink based model is developed and simulation results are presented.

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