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Power Factor Improvement in BLDC motor Using Landsman Converter

Mrs. Trupti Dhanadhya [1], Pranali Patil[2], Shaheen Mulani [3], Ankita Zodge [4], Krishna Rampurkar[5]

Asst. Professor, Department of Electrical Engineering, Dr. D. Y. Patil Institute of Technology Pimpri, Pune, India[1]

B.E. Student, Department of Electrical Engineering, Dr. D. Y. Patil Institute of Technology Pimpri, Pune, India [2]

B.E. Student, Department of Electrical Engineering, Dr. D. Y. Patil Institute of Technology Pimpri, Pune, India [3]

B.E. Student, Department of Electrical Engineering, Dr. D. Y. Patil Institute of Technology Pimpri, Pune, India[4]

B.E. Student, Department of Electrical Engineering, Dr. D. Y. Patil Institute of Technology Pimpri, Pune, India[5]

ABSTRACT : This project manages a reliable Brushless DC electrical drive. The motor is supported by a voltage source inverter (VSI) with a power factor adjustment circuit for a dc-dc converter. PID Logic Controller serves as the BLDC motor's intelligent controller. In this way, a reliable, straightforward method is offered for precisely achieving unity power factor and speed direction. Power factor correction and DC voltage control are carried out in one stage by the Landsman Converter using a single controller. The planned PFC converter improves power quality at AC voltages. The voltage source inverter (VSI) is used as an electronic commutator in BLDCM.

KEYWORDS: BLDC Motor, Landsman Converter

I.INTRODUCTION

In this study, the power factor for BLDC motor applications is enhanced using a Landsman Converter. To accomplish the following, which is difficult in conventional systems, specifically in ventilation systems. startup of the ventilation system without input voltage variations. Avoid harmonics in the power system due to the constant switching of millions of ventilation systems and the main higher efficiency.

The ventilation system is an energy-intensive application because its compressor and fans are frequently powered by single-phase induction motors. The efficiency of these motors ranges from 70 to 80%. However, the on-off control used for temperature regulation is not energy-efficient and, in addition to increasing motor wear and lowering power factor, has a number of unfavourable effects on the dispersion system. By using BLDC to drive the compressor, the air conditioner's energy efficiency is increased. Due to its low power consumption, the permanent magnet brushless DC motor has taken the place of the single-phase induction motor used in air conditioners to drive fans and compressors.

Numerous power quality (PQ) disturbances, such as low power factor and enhanced total harmonic distortion (THD) harmonics, appear when BLDCMs are fed from single-phase AC mains via a diode link capacitor. As a result, there is undesirable electromagnetic interference, which lowers the power quality. A greater torque ripple is a BLDC motor's drawback.

II.LITERATURE REVIEW

[1] **Y.SreeHarsha,R.Hariharan;"ImprovingPowerFactorusingLands-manConverterinPMBLDCMotor"**,InternationalGeneralofPureandAp-plied Mathematics (Volume 119, No. 17 2018, 3261-3267) **ISSN: 1314-3395.**InthispapertheperformanceofDC-DCconvertersisexaminedandtheoutcomesaretalkedaboutthetouchbaseatthemostappropriateconverter.TheLandsmanconverterperformspowerfactorcorrectionandDCvoltagecontrolin single stageutilizingjust asingle controller.

[2] **Dhanasekar.R, Vaishalee, Akshaya, Shruthi, Thirupurasundari, Vijaya-raja.L ; "Improved source end Power Factor Enhancement of BLDC mo-tor using Bridgeless-Landsman converter"**,2018 International Conferenceon Computation of Power, Energy, Information and Communication (ICCPE-IC),2018IEEE. Inthispaperthepro posedsystemshowcases asatisfiedperformanceandproves to be an efficient PFC for BLDCM (Brushless Dc Motor). The PFC atthe AC mains has been accomplished by devising a BL Landsman converterfor BLDCM. The speed control of BLDCM is carried out by regulating thefront-endDC bus voltageof VSI.

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[3] **Praveen Kumar Singh, Bhim Singh ,Fellow, IEEE, VashistBist, Member,IEEE, Kamal Al-Haddad, Fellow, IEEE, and Ambrish Chandra, Fellow,IEEE; "BLDC Motor Drive Based on Bridgeless Landsman PFC Con-verter with Single Sensor and Reduced Stress on Power Devices"**, 2017IEEE.
This paper focuses onLandsman converter based on a power factor correctionin bridgeless configuration feeding a brushless DC motor drive is proposed forlowpowerhouseholdappliances..Aprototypeisdevelopedtostudyperformance of the system for wide range speed control and power qualityimprovement. The experimental performance of BLDCM is presented for itsfunctions at varying voltages of AC mains to adhere the limits defined byIEC61000-3-2standard.

III. PROPOSED SURVEY

Increased power factor for BLDC motor applications using a SEPIC converter is the aim of this research. The SEPIC converter is controlled by a buck controller, which also drives a high-side PMOS FET. The SEPIC converter is an additional method for managing an unregulated input-power supply. The rotor position signals are only necessary for the electronic commutation of BLDC that uses switching of the voltage source inverter. For this project, additional components include the LANDSMAN converter, two inductors, and a series capacitor, also known as a flying capacitor. Unlike the SEPIC converter, which is set up with a typical boost converter, the LANDSMAN converter is set up from a buck controller that drives a high-side PMOSFET. The LANDSMAN converter is an additional option for managing an unregulated input-power supply, such as a cheap wall wart.

IV.METHODOLOGY

BLOCK DIAGRAM

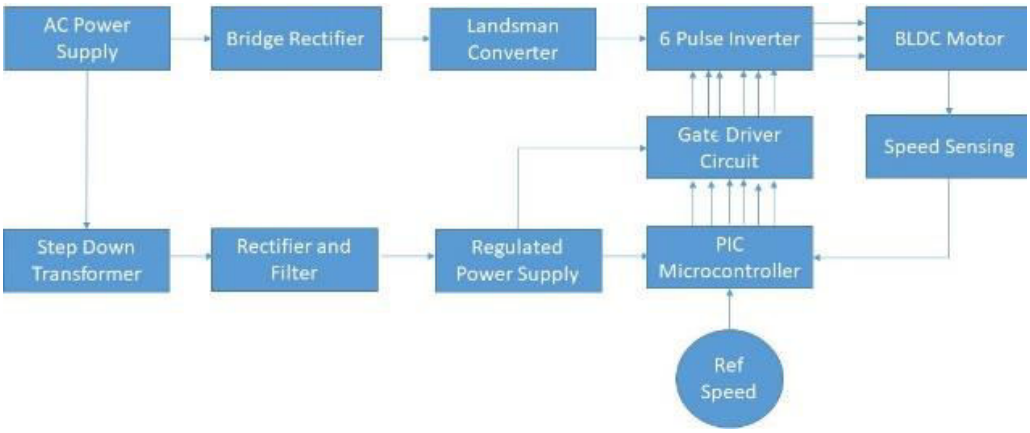

Fig. 4.1: Block diagram of Proposed System

The proposed method for landsman converter –

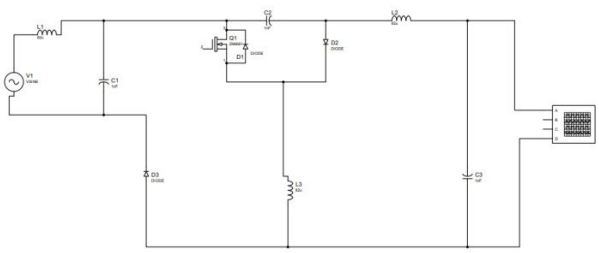

Fig. 4.2: Landsman Converter

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LANDSMAN CONVERTER-

PFR with a Landsman Converter is designed to work in DICM for natural PF regulation at AC mains. The current in the input inductor (Li) becomes discontinuous during the switching time (Ts) in DICM operation. A list of all of our open positions is provided below. the switch gate voltage (vG), the inductor currents (iLi and (iLo), the intermediate capacitor voltage (vC1), and the DC-link voltage (Vdc) fluctuate in voltage and current waveforms over the course of a switching period.

Six-Step Three-Phase Voltage Source Inverter –

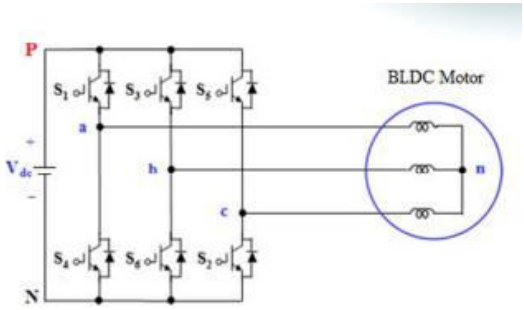

Fig. 4.3: Voltage source Inverter

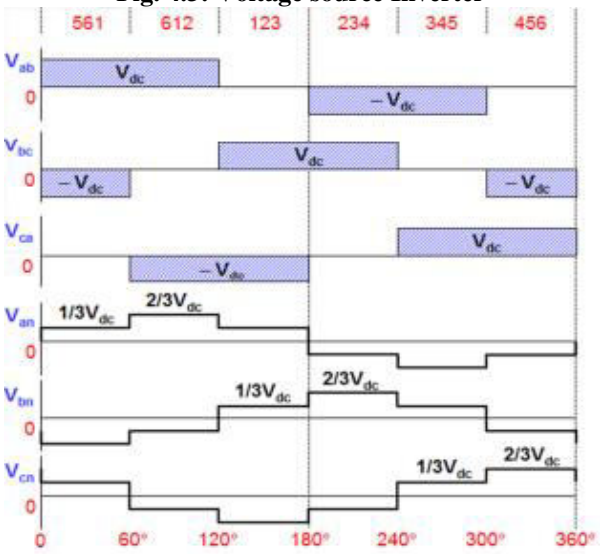

Fig. 4.4: Waveform of VSI

Operating of The Proposed Landsman Converter-
Modes of operation
Mode 1-

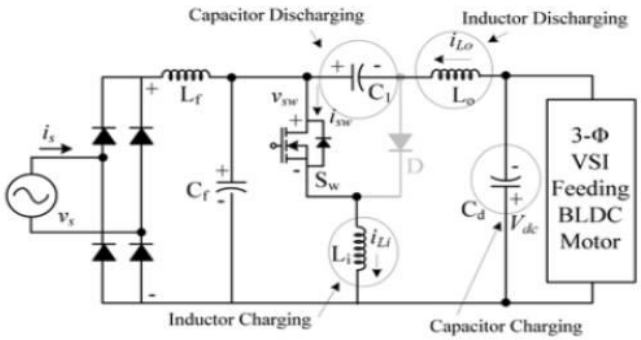

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Fig. 4.5: Mode 1 operation of landsman converter

Energy from the supply and energy that has been stored in the intermediate capacitor (C1) are transferred to the input inductor (Li) when the switch (Sw) is on. The intermediate capacitor's voltage (vC1) begins to fall as the output inductor (Lo) begins to discharge, and the DC-link voltage (Vdc) begins to rise. An intermediate capacitor's value is sufficient to store the necessary energy without causing a discontinuity in the voltage across the capacitor.

Mode 2-

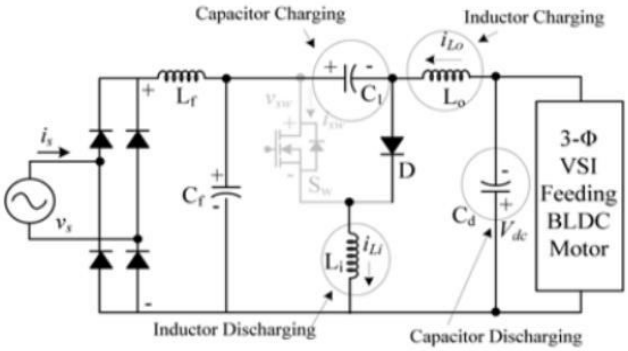

Fig. 4.6: Mode 2 operation of landsman converter

When the converter is using this mode, the switch is not on. An intermediate capacitor (C1) and DC-link side inductor (Lo) are both charging through the supply current as the output inductor (Li) starts to discharge. Consequently, in this mode, vC1 begins to rise. The voltage (Vdc) across the DC capacitor also decreases.
Mode 3-

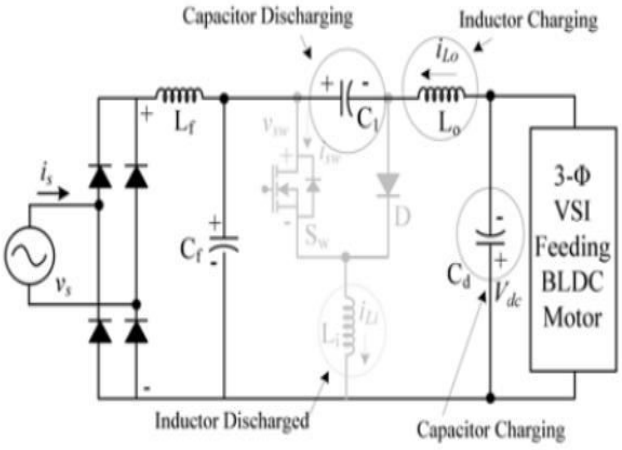

Fig. 4.7: Mode 3 operation of landsman converter

The current iLi is now zero, indicating that the DCM for converter operation has been reached, and the input inductor (Li) has been completely discharged. In this mode, the DC bus side inductor's current (iLo) starts to increase while the voltage of the intermediary capacitor (vC1) continues to fall.

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PROPOSED SYSTEM-

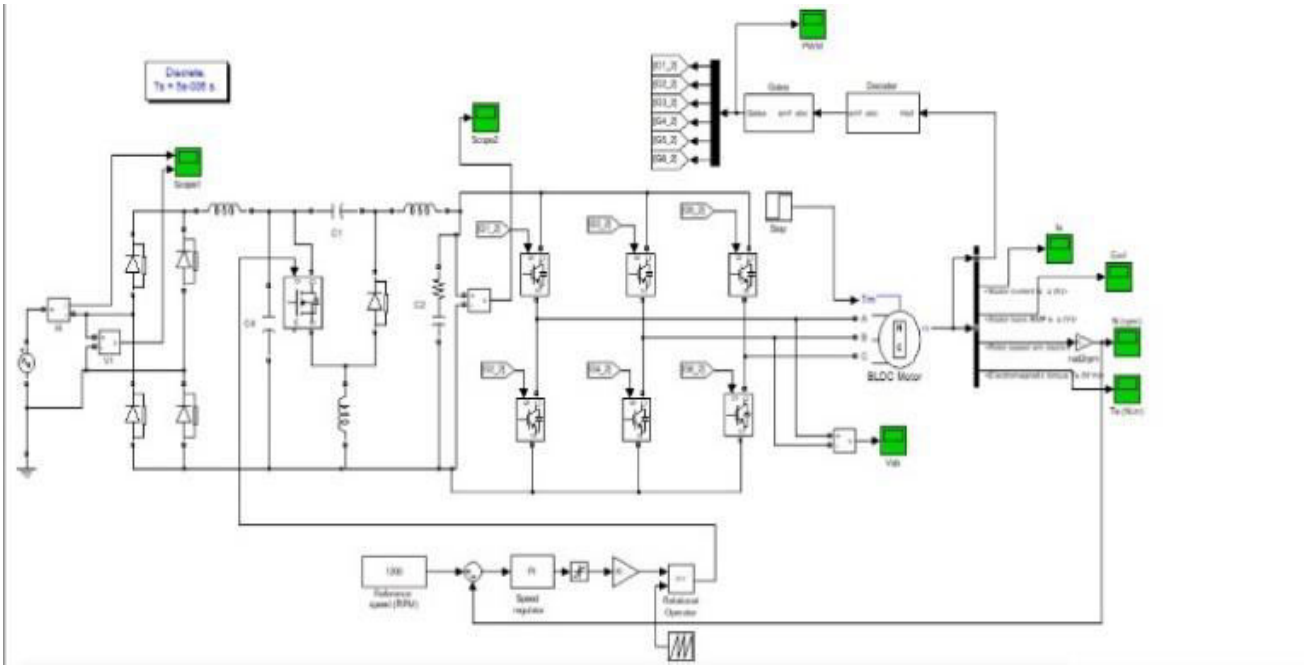

Fig. 4.8: Simulation diagram

Simulation output:

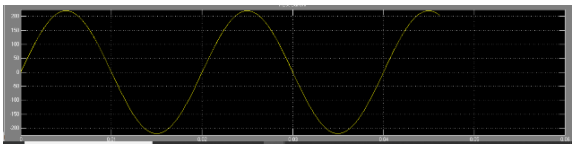

Fig. 4.9: Input voltage

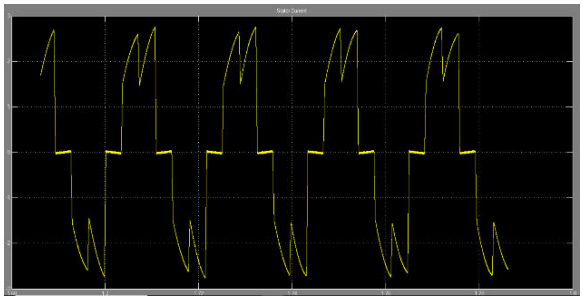

Fig. 4.10: Stator current

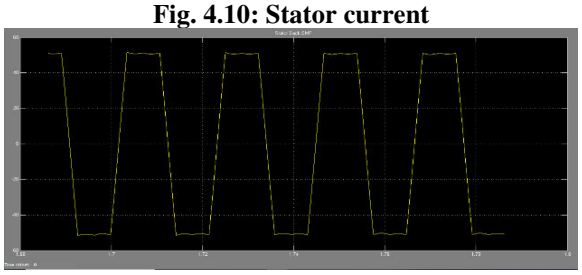

Fig. 4.10: Stator back EMF

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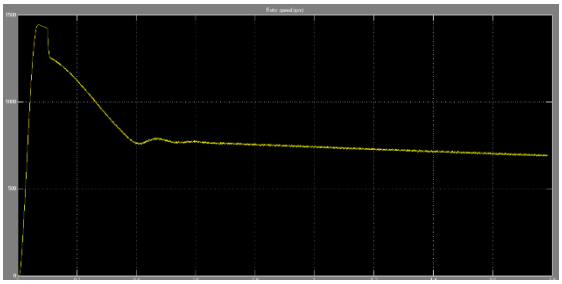

Fig. 4.11: Rotor Speed rpm

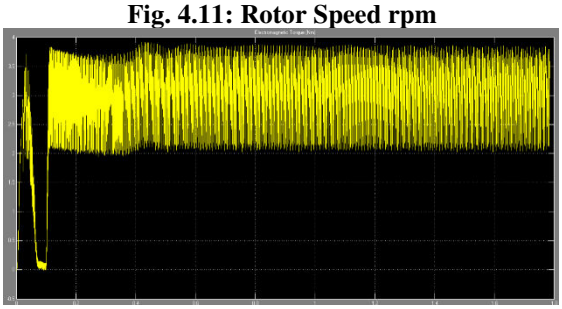

Fig. 4.12: Electromagnetic Torque

V.CONCLUSIONS

The power factor correction has been accomplished with the help of the Landsman Converter. It exhibits a noticeably improved outcome because it offers superior power quality and does away with the need to smooth out the dc yield from swells. By increasing reliability, the PID controller significantly widens the motor's application potential. The engine is directly applied in mining, aviation, and airship applications because it offers improved stability. Additionally, using NFLC and PFC converters improves this. The NFLC and Landsman Converter are used, respectively, to improve power factor and control motor speed. It is found that the Landsman Converter offers higher power quality. The Analysis Converter has helped the Landsman's Continuous Conduction situation because it can do things that neither of them can.

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