

VFD Operated Induction Motor for Centrifugal Line

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Abstract:-- Many wheelchairs are available with various running technologies, but the cost is very high and it is not much effective. Mostly, the idea of building solar wheel chair is to overcome some disadvantages of the existing systems .Solar plays a very important role in our day to day life. In this paper it is discussed that how solar power is utilized for providing the power to the wheelchair, which will reduce the efforts of the handicapped person. The wheelchair is basic need of physically disabled persons. To move the wheelchair there is need of external person or person has to take lot of efforts. Our project is specifically related to the Smart Android phone handling the wheel chair system using android application. The purpose of selecting the android platform is that nowadays android mobile phones are commonly used. The user has to first get connected with the wheelchair with the help of application. This system allows the user to robustly interact with the wheelchair at different levels of the control (left, right, forward, backward and stop) and sensing. The other components that are required in the system are microcontroller, motor and sensors. The main motive is to let the system be more simple and efficient. The proposed system will be efficient in terms of cost and handling purpose. This project uses Arduino kit Microcontroller circuit and DC motors to create the movement of wheel chair and Sensors to detect the hurdles in between wheelchair and the way of direction.

Key Words- Variable frequency drive, Operation, Circuit Diagram, Simulation and Simulation Results.

I. INTRODUCTION

Induction motor are widely used in industrial application. As per the applications ,the load on the application, but induction motor has constant speed independent on increase or decrease in load demand. Thus induction motor takes rated power from supply. That's why motor consumes same energy. Hence for load varying condition the rate of energy consumption is same. To overcome this problem a VFD is used to save the energy an electricity billing. A variable frequency drive is a type of adjustable speed drive also called as AC drives, adjustable frequency drives, frequency converters, micro drive or inverter drives. It controls the speed of the electrical motors by converting the supply frequency to adjustable values on the motor side, thus it allows the electric motor to quickly and easily adjust its speed to the required value. The two major functions of a variable frequency drive is converted power from one frequency to another, and on the other side control of the output frequency[1].

II. OPERTION

The VFD has three types PWM,VSI, CSI. The brief explanation of these three are given below:

The PWM drive is mostly used in industrial applications and operating motors that are up to 500 HP or higher. It is reliable as compare to other types of VFD's and is also an inexpensive choice as well. When turning the switch between load and supply on and off on an ongoing basis PWM drives regulate the voltage . By regulating the amount of time that the switch is off in comparison with being on, it can regulate the power being supplied to the load.

The variable speed drive converts the incoming power into DC voltage, which is regulated to produce the variable DC bus voltage that drives the motor. But there can also be some issues associated with them, including high voltage spikes and they make use of a large inductor. They are also not the best choice for applications where multiple motors are being operated from the same VFD. The VSI drive is very similar to the CSI Drive, but it uses DC voltage as a source rather than DC current. The benefits or potential problems are similar to those of the CSI Drive listed above. Input voltage is maintained constant, VSI requires feedback diodes, The commutation circuit is complicated. Power BJT, Power MOSFET, IGBT, GTO with self commutation can be used in the circuit. In a VSI drive, the DC output of the diode-bridge converter stores energy in the capacitor bus to supply stiff voltage input to the inverter. The vast majority of drives are VSI type with PWM voltage output.

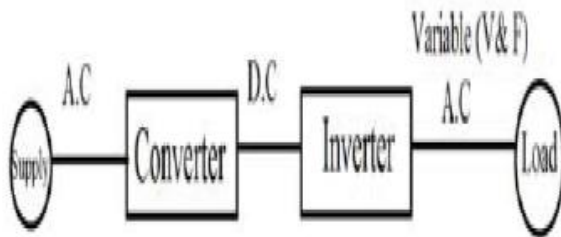


Figure 1: Block Diagram

The basic principle of VFD operation consist of three stages: Converter unit, DC bus unit, Inverter unit. In the first unit the incoming supply which is in AC form is converted to DC form. This converted DC supply contains ripples which disturbs the rest system thus to reduce these ripples a DC bus unit is used, in DC bus unit capacitor is used. Output of DC bus unit is fed to the Inverter unit, which converts DC into AC.

III. CIRCUIT DIAGRAM

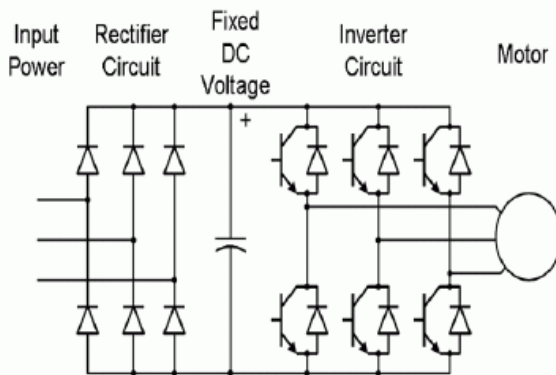


Figure 2: Circuit Diagram

i. AC Voltage Source:

A voltage source is a two terminal device which can maintain a fixed other voltage or current in circuit. It is called a dependent or controlled voltage source.

ii. Rectifier Circuit:

It is simplest possible circuit for converting AC into DC is a Rectifier. The operation of this circuit is straightforward. When V_{ac} is in the positive part of its

cycle, a positive voltage is produced on the secondary side of the transformer.

i. Diode:

The diode block models a piece wise linear diode. If the voltage across the diode is bigger than forward voltage parameter value, then the diode behaves like a linear resistor with low resistance, given by on resistance value, plus a series voltage source.

iii. DC Link:

DC link conversion the vast majority of variable frequency drive system use three distinct stages. A rectifier to convert the AC supply to DC. A DC link an inverter, which converts the dc link to an AC output.

iv. Inverter:

An inverter is an electric apparatus that changes direct current DC to AC. From this process AC electric power is produced. This form of electricity can be used to power an electric light, a microwave oven or some other electric machine. An inverter usually also increases the voltage.

I. MOSFET:

Metal Oxide Semiconductor Field Effect Transistor is a special type of field effect transistor that works by electronically varying the width of channel along which charge carries flow. The wider the channel, the better the device conducts.

v. Pulse Generator:

A pulse generator is either an electronic circuit or a piece of electronic test equipment used to generate rectangular pulses.

vi. Split Phase Induction Motor:

Single phase induction motors are not self starting without an auxiliary stator winding driven by an out of phase current of near 90 degree. Once started the auxiliary winding is optional. The auxiliary winding of permanent split capacitor motor has a capacitor in series with it during starting and running.

IV.SIMULATION OF VFD

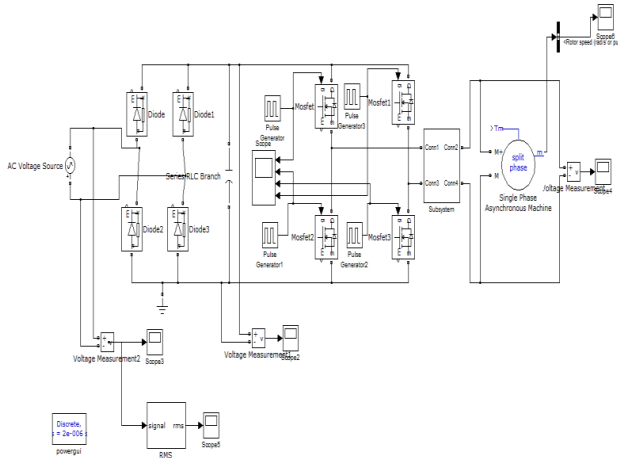


Figure 3: Simulation Of VFD

The circuit consists of a single phase rectifier circuit and the inverter circuit. In this circuit the pulse generator is denoted by “Pulse Generator” and the diode are with their numbers. The filter circuit is at the output terminal of the circuit. The supply AC source is a voltage source hence termed as AC voltage source. The voltage measurement is denoted by voltage measurement while the asynchronous motor is used as load. Six Scope are used (S6) gives the output characteristic of the topology.

IV.RESULTS OF SIMULATION

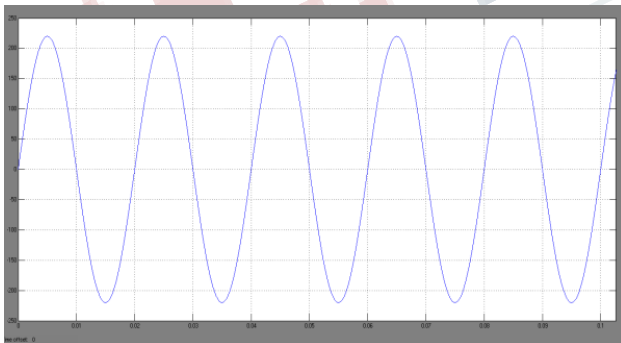


Figure 4: Input AC Supply

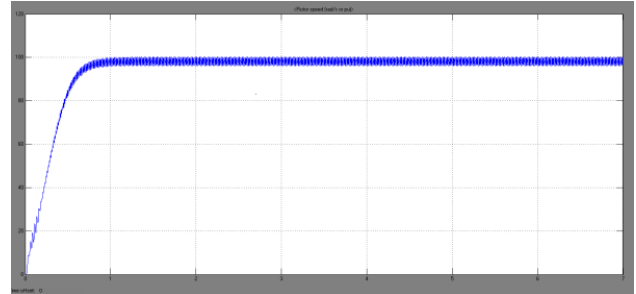


Figure 5: Output Speed at 40Hz

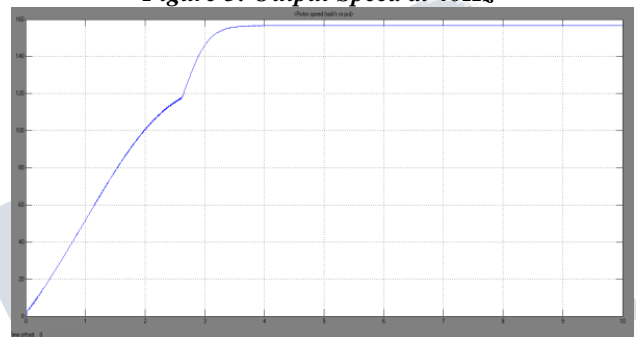


Figure 6: Output Speed at 50 Hz

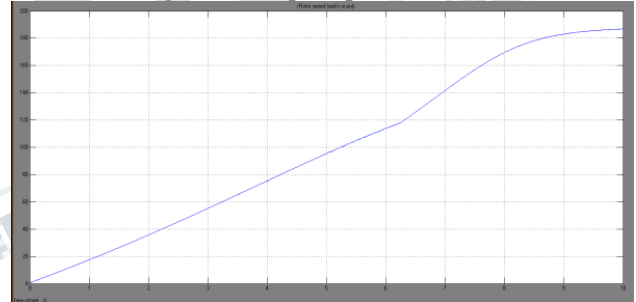


Figure 7: Output Speed at 60 Hz

CONCLUSION:

The software results are shows that as the frequency changes we can control the speed of motor. Due to change in frequency above or below 50Hz, the power is saved approximate 30%. Hence, the VFD in able to conservable the energy at variable on under loaded induction motors.

REFERENCES

1. Design , Modelling Analysis and performance evaluation of a single phase variable frequency drive for induction motor: An energy conservation approach ,

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Engineering (IJEREEE)**

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Devendra Pal Singh , D. Buddhi , IJSET, 2016 , Volume 4
issue 2.

2. Speed Control of a Three Phase Induction Motor Using
PWM Inverter, Jatin J. Patel, A.M.Kubavat, M.B.Jhala,
IJEDR, 2014

3. Modelling, Simulation and performance Analysis of A
Variable Frequency Drive in Speed Control of Induction
Motor, Enemuoh F. O, Okafor E.E, Onuegbu. J.C, Agu V.
N, International Journal of Engineering Invention,
Volume 3 Issue 5 , 2013.

4. Variable Voltage - Frequency Control Of A Single
Phase Induction Motor Driven By Shepwm Inverter, Ali
Hussein Abdul-Jabbar Al-Mustansiriyah University
College Of Engineering, Electrical Engineering
Department, Journal of Engineering, 2009.

5. Design Strategy for a 3-Phase Variable Frequency
Drive (VFD), Omar David Munoz, Senior Project,
electrical engineering department, California Polytechnic
State University, 2011.

