Survey on Thyristor Using Cyclonverter

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Abstract - This paper is based on speed control of induction motor by using cycloconverter technique by using MOSFET. The speed of induction is constant, In order to vary it we have use MOSFET controlled cycloconverter. The microcontroller use in this project is from PIC16F877A with PWM controlled cycloconverter with MOSFET switches has been observed. The induction motor widely used in water pumps , rolling mills, washing machines, and used in industries as well.

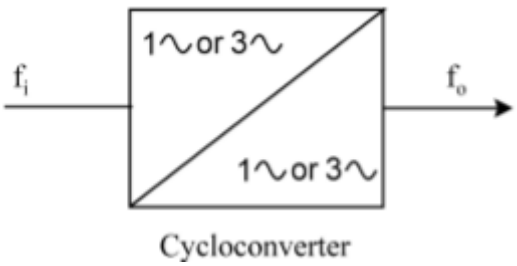
***Key Words*: Cycloconverter, Induction Motor, Microcontroller**

1. INTRODUCTION

In industrial application, induction motor of speed is necessary. There are many method to control the speed of induction motor. The cycloconverter is the best method of speed control in induction motor. A cycloconverter is a high power application driving induction motors. The cycloconverter is a device which converter AC input power at one frequency to output AC power frequency changer, the most desirable feature in power frequencies. In this paper speed control scheme for a split phase induction motor with cycloconverter which converts AC to AC conversion.

1.1 CYCLOCONVERTER

Cycloconverters are high power applications driving induction and synchronous motors. Block diagram of Cycloconverter is shown 1.1 A Cycloconverter is a type of power controller in which an alternating voltage at supply frequency is converted directly to an alternating voltage at load frequency without any intermediate DC stage. The cycloconverter also allows power to flow freely in either direction.



Cycloconverter

TYPES OF CYCLOCONVERTER:

1. Single Phase to Single phase Cycloconverter
2. Three Phase to Three Phase Cycloconverter
3. Single Phase to Three Phase Cycloconverter

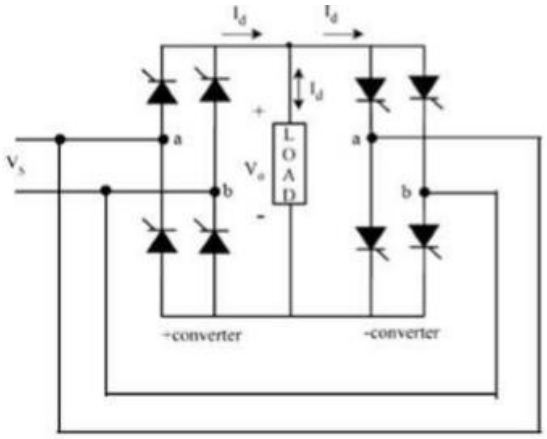


Fig 1.2: 1 phase to 1 phase cycloconverter

A cycloconverter is input frequency fi and output frequency fo. A cycloconverter is a type of power controller in which an alternating voltage supply frequency is converted directly to an alternating voltage at load frequency without any intermediate DC stage. The cyclonverter is connected as shown in fig. The operation of cycloconverter is, the singlephase to single-phase cycloconverter should be studied first. This converter consists of back-to-back connection of two full-wave rectifier circuits. Fig 2.1 shows the operating waveforms for this converter with a resistive load. The input voltage, vs is an ac voltage at a frequency, as shown in Fig1. 2 Note that the firing angles are named as P for the positive converter and N for the negative converter. Consider the operation of the cycloconverter to get one-fourth of the input frequency at the output. For the first two cycles of vs, the positive converter operates supplying current to the load. In the next two cycles, the negative converter operates supplying current to the load in the reverse direction. The current waveforms are not shown in the figures because the resistive load current will have the same waveform as the voltage but only scaled by the resistance.

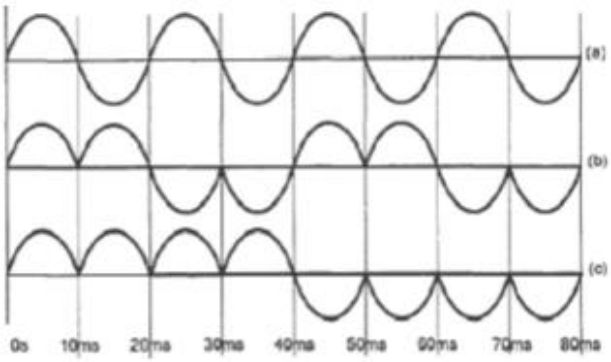


Fig.1.3 waveform

1.2 .SPLIT PHASE INDUCTION MOTOR

It is usually constructed with two windings on the stator side and squirrel cage winding in the rotor side [2].The auxiliary winding is used to produce a rotating field to start the motor. The axis of the auxiliary winding is placed 90 electrical ahead of the main winding. The simulation of the motor is presented in the stationary d-q frame to facilitate the application of the inverter and, later on, the feedback regulators. Since the axis of the main and auxiliary windings are already orthogonal, the stationary d-q axes are chosen aligned with the orthogonal axes of the physical windings. The squirrel cage rotor is represented by equivalent two coils transformed to the stationary d-q axis as. [5]

1.3. MICROCONTROLLER

In this project we had used PIC16F877A.microcontroller to deliver the pulses to trigger the SCR's in a dual bridge. Thus, the speed of the induction motor can be achieved in three steps i.e. (F, F/2 and F/3).They had used voltage regulator for thermal Overload Protection, short Circuit Protection & to maintain a constant voltage level. They had used Zero cross detector.

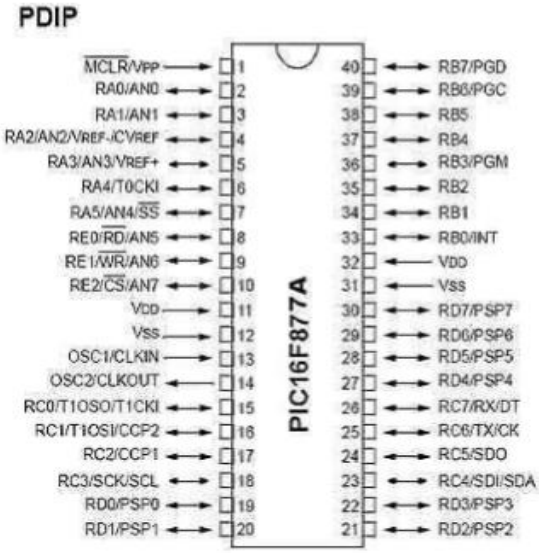


fig. 1.3 microcontroller

Features:
1. High performance RISC.
2. Only 35 single word instructions to learn.
3. Operating speed: DC - 20 MHz clock input DC - 200 ns instruction cycle.
4. Power saving SLEEP mode
5. Power-Saving Sleep Mode.
6. 35 input/output pins
7.8K ROM memory in FLASH technology.
8. A/D converter

3. LITERATURE SURVEY

Sr. no.	Title of paper	Author's Name	Publicati on Year & Details	Techniq es	Advan tages	Future scope
1	Implementin g single phase cycloconvert er using single phase matrix converter topology with sinusoida l PWM.	1) K.V.S Bharath 2) Ankit Bhardwaj	International Journal For Technolo gical Research In Engineeri ng Volume 2, Issue 6, February2015	The computer simulati on model on SPMC for cycloco nverter operatin g using MATL AB	Complex control system	Use d the thre e phas e indu ctio n mot or 2
2	A Novel Approch to Speed Control of Induction Motor by Cyclocon verter with Thyristor s	1.Sathis h Bakanag ari, 2.Jagade esh Peddapu di , 3.A. Mahesh Kumar	Sathish Bakanaga ri et al Int. Journal of Engineeri ng Research and Applicati on Vol. 3, Issue 6, Nov-Dec 2013, pp.21592164	Various frequen cy generat oit is to implem ented	It is easy to imple ment	The y are impleme nted in MA TLA B

3	Speed Control of Induction Motor using Cycloconver ter	1.B. SAI SINDU RA , 2. B. N . KARTH EEK	Internatio nal Journal of Engineeri ng Trends and Technolo gy (IJETT) – Volume 4Issue 4- april	formula for speed of inductio n motor is N=120f/ p.	simple , reliabl e and econo mical	Larg e num ber of thyri stor is requ ired.
4	Simulation of PWM Controller Cycloconver ter	1.ABHAY KUMAR DUBEY,2.RAMJEE PRASAD GUPTA	Progress In Science Engg.Reserch Journal-vol.02,issue:03/06-may-june	Output frequency of cycloconverter has been taken as two times the input frequency	The cycloconverte r is fed by fixed input voltage	Tey are Implement ed in MOSFET switch

3. PROBLEM STATEMNT

In first paper they used matrix converter topology & PWM method to control the speed of induction motor. In second paper they used Cycloconverter using thyristor to control the speed of induction motor by varying firing angle of SCR. In third paper they used formula to control the speed of induction motor. In fourth paper the speed of induction motor is changed by using PWM method & here they used IGBT. In fifth paper they used feedback technique of cycloconverter to control the speed of motor ,here they used MATLAB. In this project we control the speed of induction motor by using PWM method & MOSFET, as MOSFET reduces speed & which gain the possibility of unity gain factor.

4. Advantages

1. In a cycloconverter, ac power at one frequency is converted directly to a lower frequency in a single conversion stage.
2. Cycloconverter functions by means of phase commutation, without auxiliary forced commutation circuits.
3 .Cycloconverter is inherently capable of power transfer in either direction between source and load.
4. Commutation failure causes a short circuit of ac supply.

5. Disadvantages

1. Large number of thyristors is required in a cycloconverter, and its control circuitry becomes more complex.
2. It is not justified to use it for small installations, but is economical for units above 20 kVA.
3. For reasonable power output and efficiency, the output frequency is limited to one-third of the input frequency.
4. The power factor is low particularly at reduced output voltages, as phase control is used with high firing delay angle.

6. Application

1. Cement mill drives
2. Ship propulsion drives
3. Rolling mill drives
4. Scherbius drives
5. Ore grinding mills

7. REFERNCES

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