1-Phase To 3-Phase Motor Speed Control

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ABSTRACT

In different sorts of speed control same period of supply is required to control same period of Induction Motor (I.M) yet now we utilized 1 stage supply to control 3 stage I.M utilizing Variable Frequency Drive (VFD) method. We change or change over the 1 stage supply in 3 stages utilizing smaller scale controller. VFD is the most well-known innovation and simple to utilize. This will helps in vitality preservation and numerous different focal points at modern. Utilizing this instrument we can control the 5HP engine without changing in any segment and in the event that we would build restrict its conceivable with some minor changes in current constraining protection. This method is interesting and present day so utilizing of this procedure is exceptionally straightforward and proficient. By utilizing this technique we can control the speed of engine effectively.

Keywords:-Pulse width modulation, Variable frequency drive, speed control, 3-phase induction motor

I. INTRODUCTION

Acceptance engines have been utilized as a part of the past fundamentally in applications requiring a steady speed in light of the fact that ordinary strategies for speed control have been either costly or wasteful.

Variable speed applications have been commanded by dc drives. Since speed control of the D.C engine is simple contrast with the A.C engine. As accessibility of Thermistors, Power Transistors, Insulated Gate Bipolar Transistor (IGBT) have permitted that improvement of variable speed acceptance engine drives.

The principle disadvantage of dc engines is a nearness of commutrator and brushes, which require visit support and make them unsatisfactory for unstable

and messy condition.Then again, Induction Motor, especially squirrel-confine is rough, less expensive, lighter, littler, and more productive, require bring down upkeep and can work in filthy and unstable situations. Albeit variable speed enlistment engine drives are by and large costly than dc drives, they are utilized as a part of number of utilizations like cranes, transports and so on in light of the benefits of Induction engines.

In this task we are taking a shot at another sort of Variable Frequency Drive (VFD). A Variable Frequency Drive (VFD) is a sort of engine controller that drives an electric engine by differing the recurrence and voltage provided to the electric engine. Different names for a VFD are variable speed drive, movable speed drive, flexible recurrence drive, AC drive, Microdrive, and inverter.

The main phase of a Variable Frequency AC Drive, or VFD, is the Converter. The converter is included six diodes, which are like check valves utilized as a part of pipes frameworks. They enable current to stream in just a single course; the heading appeared by the bolt in the diode image. For instance, at whatever point A-stage voltage
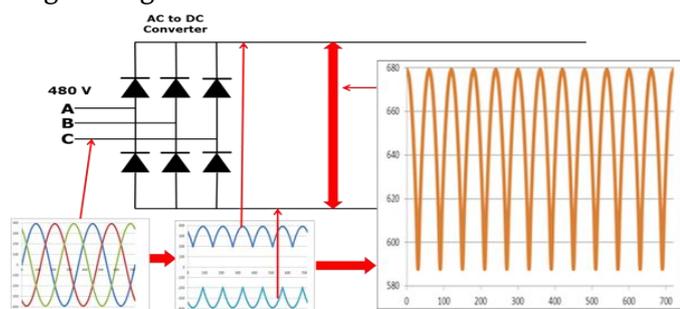

Figure 1 Rectifier circuit and waveforms

is more positive than B or C stage voltages, at that point that diode will open and enable current to stream. At the point when B-stage turns out to be more positive than A-stage, at that point the B-stage diode will open and the A-stage diode will close. The same is valid for the 3 diodes on the negative side of the transport. Along these lines, we get six current

"heartbeats" as every diode opens and closes. This is known as a "six-beat VFD", which is the standard design for current Variable Frequency Drives.

In which we changed the Pulse Width Modulation (PWM). Primary reason for change of heartbeat is that we get 3 stage regulated supply. So we can control the speed of 3phase acceptance engine.

2. METHODS AND MATERIAL

- Followingmethods are employed for speed control of Induction motors:-
  1. Pole changing control
  2. Stator voltage
  3. Supply frequency control **(Using Method)**
  4. Eddy current coupling
  5. Rotor resistance control
  6. Slip power recovery

1. Supply frequency Control:-

Variable Frequency Drive (VFD) This gadget utilizes control hardware to fluctuate the recurrence of information energy to the engine, consequently controlling engine speed. Including a variable recurrence drive (VFD) to an engine driven framework can offer potential vitality investment funds in a framework in which the heaps shift with time. VFDs have a place with a gathering of hardware called movable speed drives or variable speed drives. The operating speed of a motor connected to a VFD is varied by changing the frequency of the motor supply voltage. This allows continuous process speed control. Motor-driven systems are often designed to handle peak loads that have a safety factor. This often leads to energy inefficiency in systems that operate for extended periods at reduced load. The ability to adjust motor speed enables closer matching of motor output to load and often results in energy savings.
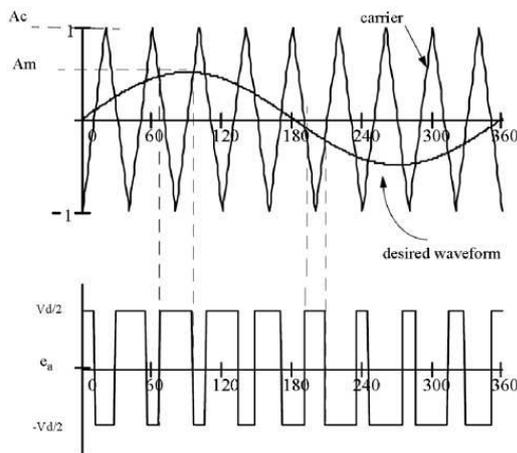
Figure 2. Pulse width modulation technique

2.1 EQUIPMENT USED IN PROJECT

Diode, Capacitors, Resistors,Crystal, Transformer, 7805 voltage regulator, Opto coupler, Mosfet, Bridge rectifier, Heat sink, Push button switch, LCD display,Lamp 200W,LED,BC547transistor,BC557transistor,MICROCONTROLLER89S52,TACT,SWITCHES,Diode,Zenerdiode,Micro-controller PIC16F877
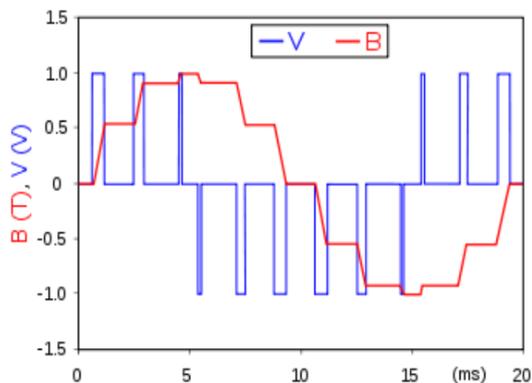
3. RESULT & DISCUSSION:-

Fig.3 CRO output waveform.

This is the regulated waveform which we have to control the 3-stage acceptance engine. In our venture we create the 3 stage sine wave from D.C supply.

Presently this D.C supply goes to Switching Circuit which comprises of opto coupler and Metal Oxide Field Effect Transistor (MOSFET).

MOSFET utilized as exchanging gadget which has given charge by Microcontroller.

A programming of Microcontroller is done as such exchanging task by MOSFET is done with the end goal that we got 3-stage supply in the yield.

Be that as it may, those waves are not unadulterated sinusoidal wave; it's an adjusted Square wave in which we can change its width by choosing our required recurrence.

In this, we utilized Variable Frequency drive to change recurrence as indicated by got wanted speed.

Heartbeat width Modulation utilized for changing heartbeat widths as indicated by recurrence.

3.1 Advantages:-

➢ Reduced starting voltage
➢ Improved process control
➢ Lower system maintenance
➢ Bypass capability
➢ Multi- motor control

3.2 Disadvantages:-

➢ Initial cost is high
➢ Maintenance cost is high (with use of some component)
➢ Motor heating at lower speed operating
➢ Output harmonics

3.3 Application:-

➢ HVAC ,fans and pump
➢ Food processing
➢ Petrochemicals
➢ Mining and metals
➢ Machines tools
➢ Transportation
➢ Also used in the traction system

3.5 Limitation:-

➢ With this we can run maximum 5hp 3phase motor at no load condition. Ifwe want to increase the current we have to reduce the current limiting resistance value.

3.6 Conclusion:-

➢ To control the speed of a 3 phase induction motor in open loop, supply voltage and frequency need to be varied with constant ratio to each other .A low cost solution of this control can be implemented in a PIC microcontroller. This requires three PWM to control a 3-phase inverter bridge.

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