



Implementation of Bi Directional Rotation of Single Phase Induction Motor without Run Capacitor

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Abstract — The main winding is designed to take the load current. The current flowing through the start winding having a capacitor in series, is much less than the main winding. In order to produce the magnetic force produced by the start winding very near A capacitor run single phase induction motor is usually a 2 phase asymmetrically wound motor

Index Terms—Bi direction rotation of induction motor, voltage regulator, microcontroller chip, snubber circuit.

I. INTRODUCTION

A capacitor run single phase induction motor is usually a 2 phase asymmetrically wound motor.

The main winding is designed to take the load current. The current flowing through the start winding having a capacitor in series, is much less than the main winding. In order to produce the magnetic force produced by the start winding very near to the main winding the start winding has additional turns, higher resistance and reduced current flowing through it. This makes the motor windings asymmetrical.

The value of the capacitor is so chosen that the total impedance on the start winding produces sufficient phase shift of about 90 degrees to generate a rotating magnetic field. Using a microcontroller with a 3 phase bridge and using one as the common and the other 2 as 2 phases out of phase by 90 degrees produces the same effect.

This abstract describes the theory capacitor run and the project shall be made using a programmed microcontroller of 8051 family duly interfaced to 3 inverters(2phases, 1neutral) with 6 no's MOSFET or IGBTs from DC derived from a single phase supply. The program also takes care of reversing the rotation by automatically reversing the phases upon a push button. The starter winding has a capacitor incorporated which makes the single-phase motor a self-starting one. Read on to learn about the different types of widely used capacitor-motors. The single-phase induction motor can be made to be self-starting in numerous ways. One often-used method is the Split Phase motors. Another method is the Capacitor Start Induction Run Motors. We know about the activity of a capacitor in a pure A.C. Circuit. When a capacitor is so introduced, the voltage lags the current by some phase angle. In these motors, the necessary phase difference between the I_s and I_m is obtained by introducing a capacitor in series with the starter winding. To avoid this we run induction motor without run capacitor

Drawbacks of using run capacitor. [Earlier Method]

- The single phase induction motor is basically a self starting using a run capacitor.
- All the motors require these starting capacitors without this the induction motor does not start.
- So in absence of this starting capacitor the motor has to be started and stopped manually.
- If the start capacitor selected for a specific induction motor is not exact as designed for the motor it may lead to an ununiform magnetic field in the motor windings..
- This leads to the noise in the motor and leads to mechanical failure

Maintenance is bit difficult as there are more mechanical parts in the system.

Solution :

There are so many other different techniques for the solution this problem. But those are not that reliable. In order to reduce man intervention and save the labor cost and time both we can use microcontroller to control, operate and synchronize this task. We can program microcontroller to control its clockwise and anti-clockwise direction and get our work done.. Using a microcontroller with a 3 phase bridge and using one as the common and the other 2 as 2 phases out

of phase by 90 degrees produces the same effect. The program also takes care of reversing the rotation by automatically reversing the phases upon a push button.

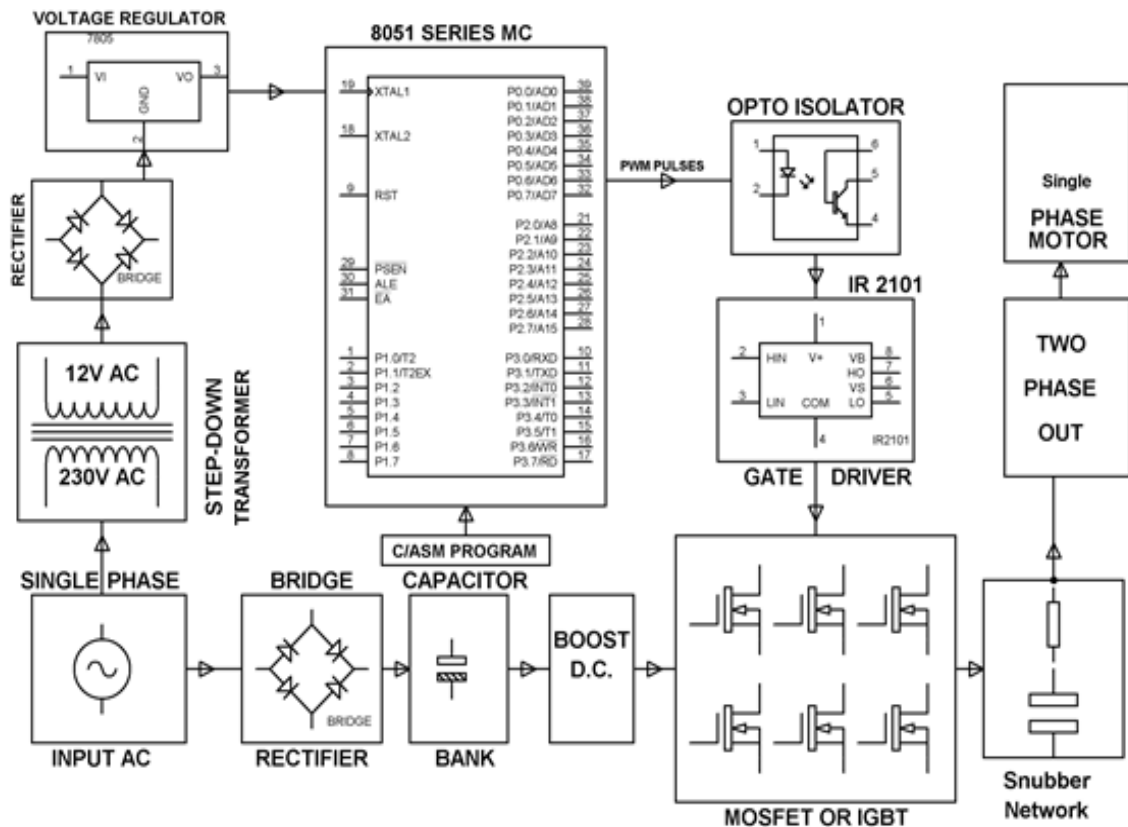
II. HARDWARE REQUIREMENTS:

Microcontroller, MOSFET/IGBT gate driver, Crystal Oscillator, Toggle Switches, Resistors, Capacitors, Diodes, Transformer, Regulator, opto-isolators.

III. SOFTWARE REQUIREMENTS:

Keil compiler, Languages: Embedded C Or Assembly

IV. BLOCK DIAGRAM :



V. HARDWARE COMPONET:

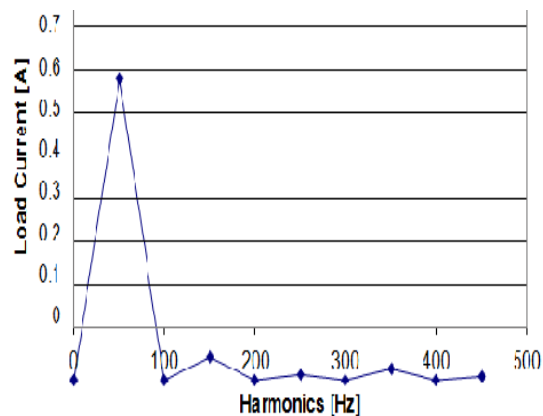


VI. SOFTWARE REQUIRED:

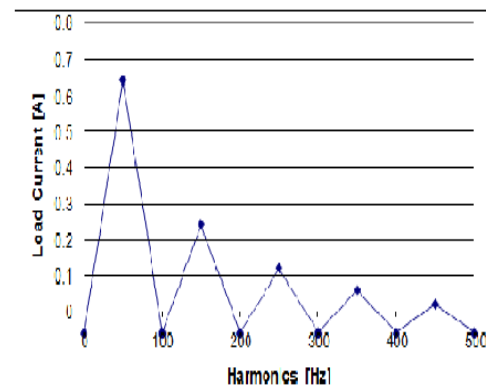
- Keil an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 MCU families.
- Compilers are programs used to convert a High Level Language to object code. Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors.
- i.e., the programs written in one of the HLL like 'C' will compile the code to run on the system for a particular processor like x86 (underlying microprocessor in the computer).

VII. WORKING OF PROJECT:

- A single phase is made to run in clockwise and anticlockwise direction without using run capacitor
- .A single phase induction motor with two mains and a common.
- This task of bi direction rotation is accomplished by using microcontroller program.
- Control of direction of motor is possible by using start and push button as structured in the program
- A capacitor run single phase induction motor is usually a 2 phase asymmetrically wound motor . The main winding is designed to take the load current .The current flowing through the start winding having a capacitor in series , is much less than the main winding .In order to produce the magnetic forces produced by the start winding very near to the main winding the start winding has a additional turns, higher resistance and reduced current flowing through it. This makes the motor winding asymmetrical.The sufficient phase shift of about 90 degrees to generate the rotating magnetic field.



CURRENT VS HARMONICS USING RUN CAPACITOR



CURRENT VS HARMONICS WITHOUT RUN CAPACITOR

VIII. ADVANTAGE OF USING SINGLE PHASE INDUCTION MOTOR WITHOUT RUN CAPACITOR

- Smaller and lighter
- Less Expensive
- Simple In Construction
- At residential sites and small ponds.
- Used in low power applications(less than 5 kw)
- Can operate in dusty and explosive environment.

IX. CONCLUSION AND RESULT :

It is observed that when supply is switched on, the motor starts rotating in clockwise direction, and on pressing the push button present on the pcb, enables the motor to rotate in anti-clockwise direction. Using the microcontroller program enables the motor to rotate in both directions (clockwise and anti-clockwise direction).

It is simpler compared to other methods of rotating motors, flexible in design, lighter in weight and suitable for low power applications.

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