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Soft Starting Of Induction Motor By Using Ac PWM

[1]Mr.Ashwin Waikar,[2]Mr.Ashish Kamble,[3] Mr.Himanshu Raulkar,[4]*Prof.G.H.Agrawal*
Dept. of Electrical Engineering, K.D.K.college of engineering, Nagpur,-440009

Abstract- *This paper, present a soft starting of induction motor. At the time of starting induction motor takes very large current and have low power factor. Due to this high current the motor contains high torque and transients and due to this transient and high torque the motor experienced jerk and hence life of rotor deceases.*

In order to minimize this adverse effect of high starting current one method is used which is electronically controlled soft starring of the induction motor. By using soft starter performance of induction motor is improved and also improved load torque characteristics.

Keywords-Induction motor, microcontroller, IGBT, zero cross detector

I- INTRODUCTION

High starting current results in a mechanical jerk and high electrical stress on the windings of the motor. Sometimes the windings may get burnt. The induction motor should start smoothly and gradually catch up the speed for a safer operation and longer life.

The ac motor starters employing power semiconductors are being increasingly used to replace electromagnetic line starters and conventional reduced-voltage starters because of their controlled soft-starting capability with limited starting current. Thyristor based soft starters are cheap, simple, reliable, and occupy less volume, and therefore, their use is a viable solution to the induction motor (IM) starting problem.

II HARDWARE IMPLIMENTATIONS

Microcontroller AT89S52

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

Single phase induction motor

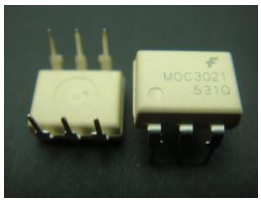
An induction motor is a type of alternating current motor where power is supplied to the rotor by means of electromagnetic induction. An electric motor turns because of magnetic force exerted between a stationary electromagnet called the stator and a rotating electromagnet called the rotor. Different types of electric motors are distinguished by how electric current is supplied to the moving rotor. In a DC motor and a slip-ring AC motor, current is provided to the rotor directly through sliding electrical contacts called commutators and slip rings. In an induction motor, by contrast, the current is induced in the rotor without contacts by the magnetic field of the stator, through electromagnetic induction. An induction motor is sometimes called a rotating transformer because the stator (stationary part) is essentially the primary side of the transformer and the rotor (rotating part) is the secondary side.

IGBT

IGBT (Insulated Gate Bipolar Transistor) is a three terminal power semiconductor device with huge bipolar current caring capability. An IGBT can be switched ON by Appling voltage drive at its gate terminal and it is switched OFF by disconnecting.

This device is designed to make use of both the benefits of BJT and MOSFET devices in the form of monolithic.

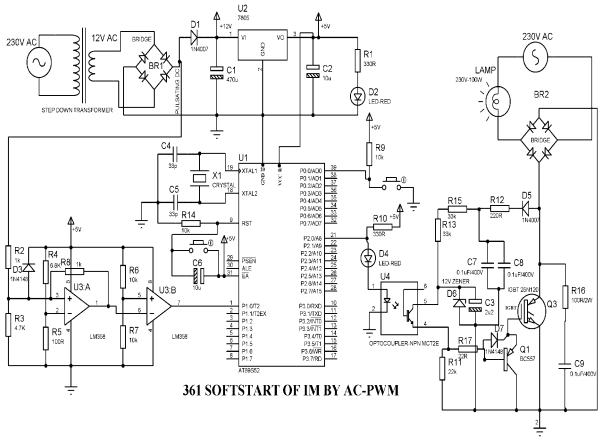
Opto-Isolator



A lot of electronic equipment nowadays is using optocoupler in the circuit. An optocoupler or sometimes refer to as optoisolator allows two circuits to exchange signals yet remain electrically isolated. This is usually accomplished by using light to relay the signal. The standard optocoupler circuits design uses a LED shining on a phototransistor-usually it is a npn transistor and not pnp. The signal is applied to the LED, which then shines on the transistor in the IC.

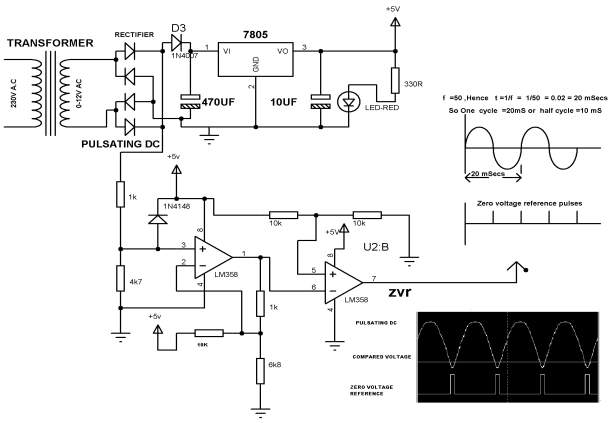
The light is proportional to the signal, so the signal is thus transferred to the photo-transistor. Optocouplers may also come in few module such as the SCR, photodiodes, TRIAC of other semiconductor switch as an output.

Control circuit



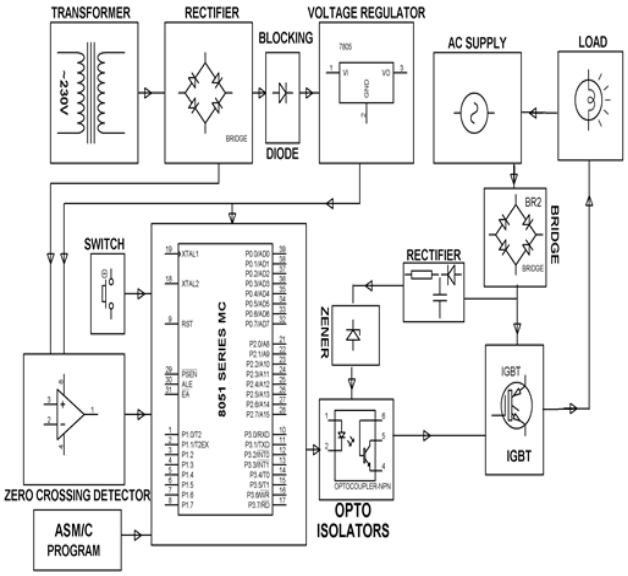
The IGBT is the main control switch here. While drive is given to the G (gate) of the IGBT, the C & E (collector & emitter) closes like a switch thus the ac power flows through the lamp. Thus if the IGBT is triggered with a specific duty cycle at high frequency , the IGBT switches on and off several times accordingly during each half cycle.

Zero voltage cross detection using comparator



A zero crossing detector is a comparator with the reference level set at zero. It is used for detecting the zero crossings of AC signals. It can be made from an amplifier with an input voltage at its positive input. When the input voltage is positive, the output voltage is a positive value, when the input voltage is negative, the output voltage is a negative value. The magnitude of the output voltage is a property of the operational amplifier and its power supply.

Working



A soft start control technique for the single-phase AC induction motor. It presents a design of a low-cost; high-

efficiency drive capable of supplying a single-phase AC induction motor with a PWM modulated sinusoidal voltage during start. The device is aimed at substituting the commonly used triac phase angle control drives. The circuit is capable of supplying a single-phase AC. induction motor with varying AC voltage at the start. Same as in triac control, the voltage applied to the load is varied from zero to maximum value in a small span of time during start. On the other hand, it uses a pulse width modulation technique (PWM), and when compared with the phase angle control used for triacs, it produces much lower high order harmonics. Thus, it suits EMC/EMI regulations much better.

Because the circuit is aimed at low-cost, low/medium-power applications, it does not use a conventional converter topology to produce the output voltage waveform. It directly modulates the mains AC voltage. In summary, the device attempted here takes advantage of both the low price of the phase angle control and the low harmonic content and high efficiency that we can get with standard converter topology.

The drive uses a PWM controlled MOSFET and the load in series with a bridge rectifier .The input terminals of the rectifying bridge are connected in series to the load. The output terminals (rectified side) has a power transistor (IGBT, MOSFET or bipolar) connected across

Them. When the power transistor is off, current cannot flow through the rectifying bridge and the load which is in series remains in an off-state. When the power transistor is on, the bridge output terminals are short-circuited, then current can flow through the rectifying bridge and thus through the load. Thus by changing the duty cycle of the PWM pulses the power to the load is controlled.

Advantages

Smooth acceleration of motor, small size of controller. Starting current can be adjusted to small value, Harmonics reduction is possible, overall maintenance cost of motor reduces**.**

III. CONCLUSION

A simple technique to control the induction motor electromagnetic torque during soft starting has been presented. Using this technique, the motor torque can be tailored according to the load torque, and the acceleration can be maintained constant over the entire starting period. The proposed strategy eliminates the shaft-torque pulsations during the starting process and increase the life of the induction motor.

REFERENCE

[1] *G. Bhuvaneswari, Charles. S and Manjula G. Nair. "Power Quality Studies on a Soft Start for an Induction Motor".2008 IEEE.*

[2] *Soft Starting of Induction Motor With Torque Control"IEEE PAPER Ademir Nied, Member, IEEE, José de Oliveira, Rafael deFarias Campos, Rogério Pinho Dias, and Luiz Carlos de Souza Marque.*

[3] *Ahmed Riyaz, Atif Iqbal, Shaikh Moinoddin, SK. MoinAhmed and Haitham Abu-Rub "Comparative Performance Analysis of Thyristor and IGBT based induction motor soft starters". International journal of engineering, Science and Technology Vol.1, No.1, 2009, pp. 90-105.A. M.*

[4] *Eltamaly, A.I. Alolah and R.M.Hamouda "Performance Evaluation of Three Phase Induction Motor under Different AC Voltage Control Strategies". 2007 IEEE*

[5]. *Yao Lu1, Jun Tong2, Qian Zhang3, Lei Sun4 College of Electrical and Control Engineering, Xi'an University of Science and Technology, Xi'an 710054.*

[6]. *Aleksandra Damjanovic Ph.D.E.E, E.E Ieee Member Motortronics Inc. Shine Drive Clear Water, Fl, 33765, Usa Aleksandar@Phasetronics.Com.*

[7]. *Sneha M Mukare (Electrical And Electronics Department,Hirasugar Institute Of Technology Nidasoshi ,Karnataka, India) Iosr Journal Of Electronics And Communication Engineering (Iosr-Jece) Issn: 2278-2834, Isbn: 2278-8735,Pp: 27-32 Www.Iosrjournals.Org*

[8]. *Vishva Pandya, vinod Patel, 3hina Chandwani ,Electrical Department, Itm Universe, Baroda, India,,Amtech,Electronics, Gandhinagar, India.*