

SOFT STARTER OF SINGLE PHASE PUMP MOTOR

S.A. Rai*, J.O Dubey *, A. Gupta
*University of Mumbai.

ABSTRACT:

In single-phase induction motor of ratings beyond a certain limit of withstand take very large currents and low power factor while being started directly from a 1-phase supply. In order to mitigate the adverse effects of starting torque transients and high inrush currents in induction motors, a popular method is to use electronically controlled soft-starting voltages utilizing TRIAC. Normally soft-starters are used for avoiding this problem and to achieve smooth starting of large capacity induction motors. Soft starters use ac voltage controllers to start the induction motor and to adjust its speed. The performance of a voltage controlled large induction motor soft starter has been improved, resulting in nearly perfect current and torque profiles. Soft starters are used as induction motor controllers in compressors, blowers, fans, pumps, mixers, crushers and grinders, and many other applications. Starting torque pulsations are eliminated by triggering back-to-back-connected TRIAC at proper points on the first supply voltage cycle. The soft starter is connected in motor drive during the starting condition only and once the motor get its rated speed then the soft starter is disconnected from the main motor system so that the motor get protected.

1. INTRODUCTION

A motor soft starter is a device used with AC electrical motors temporarily reduce the load and torque in the power train and electric current surge of the motor during start-up. The average voltage is controlled by varying the conduction angle of the switches.

Like induction motor (IM) variable speed drives, soft starters are also essential components in every modern IM drives and automation systems. In almost every application the squirrel cage Induction Motor is used. Whenever a squirrel cage induction motor is started, the electrical system experiences a current surge, and the mechanical system experiences a torque surge. With line voltage applied to the motor, the current can be anywhere between four to ten times the motor full-load current. The magnitude of the torque (or turning force) that the driven equipment will be in excess of 200% of the motor full-load torque. These current and torque surges can be reduced substantially reducing the voltage supplied to the motor during starting. AC voltage-controller-based soft starters offer many advantages over conventional starters.

2. CURRENT SCENARIO :

The constant Volts Hertz control method is the most popular method of Scalar control, controls the magnitude of the variable like frequency, voltage or current. The magnitude of stator flux is proportional to the ratio of stator voltage and the frequency. If ratio is kept constant the stator flux remains constant and motor torque will only depends upon slip frequency. Open-loop speed control of an induction motor provides a satisfactory variable speed drive when the transient performance characteristics are undemanding and when the motor operates at steady speeds for long periods. The demerit of this system is that it cannot be used in the presence of supply voltage fluctuations and loads disturbances. Also, when the drive requirements include rapid acceleration and deceleration, an open-loop system is unsatisfactory because the supply frequency cannot be varied quickly without exceeding the rotor breakdown frequency. However, when fast dynamic response and greater speed accuracy are needed, closed-loop control methods are essential, but a precise feedback system must be used to sense the rotor speed and adjust the inverter frequency accordingly. For adjustable speed applications, variable voltage and variable frequency is prevalent. The simple principle is to keep stator flux($\phi = V_s / \omega_e$) constant by changing voltage with proportional to frequency. with single

3. OBJECTIVE:

The AC ripples is filtered out by using a capacitor and given to the input pin of voltage regulator 7812. At output pin of this regulator we get a constant 12V DC which is used for Different IC's in project

4. MOTIVATION :

A soft starter eliminates the undesired side effects. Several types based on control of the supply voltage or mechanical devices such as slip clutches were developed. This lengthens service life, improves operating behavior, and smooth work flows. Electrical soft starters is use as solid state devices to control the current flow and therefore the voltage applied to the motor.

5 . PROBLEM DEFINATION:

❖ Problem definition stage

The main aim of these projects provides a protection for **single phase pump induction motor** by applying initial low voltages and high voltages for **soft start**.

And to implement hardware circuit (soft start circuit) in a pump motor.

Designing block diagram :

The designing of the block diagram plays a very important role as it visually describes the system as a whole displaying the significant elements of the system. The diagram below is the block diagram of the project

Implementing circuits and components:

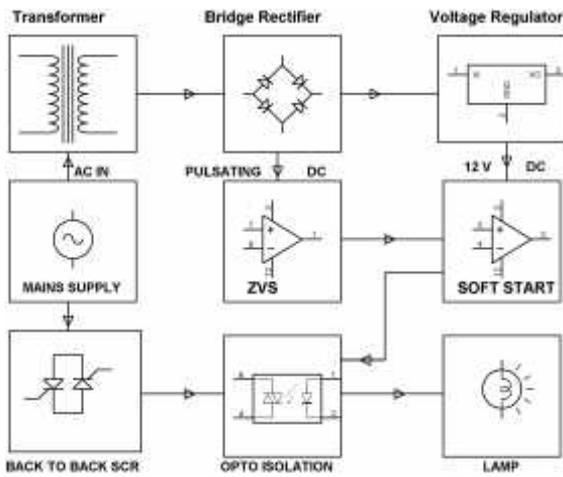
This is the actual implementation of each block. At this stage we have designed each block separately and finally integrated them into the complete working system.

6. THE PROPOSED SYSTEM:

The single-phase induction machine is the most frequently used motor for refrigerators, washing machines, clocks, drills, compressors, pumps, and so forth. The single-phase motor stator has a laminated iron core with two windings arranged perpendicularly.

- One is the main.
- The other is the auxiliary winding or starting winding

7. DESIGN PHASE: BLOCK DIAGRAM:



10. APPLICATIONS:

- Steel industries
- Cement industries
- Sugar plants
- Paper and pulp
- Rubber and plastic
- Textile industries
- Machine tool applications
- Power sector

8. HARDWARE REQUIREMENTS:

- Voltage supply
- Transformer
- Silicon controlled rectifier
- Diode
- Capacitor(470uf)
- Resistor(1k)
- Single phase induction motor

9. SCOPE:

In future, the PLC based motor starting and protection is the main option as it is reliable, safe and economical. We can save lot of wiring and troubleshooting headaches with PLC based motor monitoring and protection. Furthermore, the project can be enhanced by using six SCRs: two connected back to back for each phase.

11. REFERENCES:

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