

# GSM BASED SOFT STARTER FOR THREE-PHASED INDUCTION MOTOR

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**Abstract-** Soft starter become a very important part of induction motor. Starting an induction motor is always has been a very difficult task because induction motor draws a very high current and torque that may burn the windings of induction motor. Engineers with the passage of time proposed and implemented several techniques to overcome this problem of controlling initial high current and torque value. Some techniques, for example, star-delta, direct online, auto transformer etc. are currently being used in different industrial setups to run induction motors smoothly but every technique has some limitations or constraints. By using this technique initial high current and torque control during starting of an induction motor and after getting desire speed induction motor run at full speed. This proposed work is an extension of new engineering design technique, a modern and state of the art teaching which will run an induction motor smoothly. An induction motor will run only because of the phase difference between the stator magnetic field and rotor magnetic field. If phase difference is same as induction motor will not run, so phase difference is necessary and because of this phase difference, rotor magnetic field tries to catch stator magnetic field and draws a current. When the induction motor runs at full speed, current increases to high value which in turn increases the value of torque. As motor runs at full speed, current increases to high value which in turn increases the value of torque. As result of initial high current the winding of induction motor damage and cause overheating.

**Keywords** - Rectifier circuit, GSM Modem, AT command, Microcontroller

## I. INTRODUCTION

We will implement a soft starter with the help of thyristor. It provides soft and smooth start to 3-phase induction motor. The 3-phase induction motor during the initial starting condition draws up much higher current than its capacity and motor instantly reaches full speed. This result in mechanical jerk and high electrical stress on the windings of motor. The induction motor should start smooth and gradually to speed for safer operation. It consist of six anti-parallel SCRs, two for each phase, the output of which is connected to the coils of 3-phase induction motor. The charging and discharging of capacitor is interface to comparators resulting in delayed firing pulses during start and then gradually reducing the delay till motors run at the full speed

The output of signal conditioning circuit which consist of six anti-parallel SCRs given to microcontroller as input. water level sensor is given to the microcontroller as a

input and if water level is falls below certain level then water level sensors sense the level and send a signal to controller's module is used to send message to user mobile that water level is falls below and users can control motor from mobile.

**A. Objectives:** The objectives of this project are to design a soft starter with following salient features:

1. Reduced starting current
2. Reduced electrical power cost
3. Wide range of torque and current ratings
4. Surge current protection for starting conditions

**B. Features:**

- a) Highly Reliable for 24x7 operation with Matched Antenna
- b) Status of Modem Indicated by LED
- c) Simple to Use & Low Cost
- d) Quad Band Modem supports all GSM operator SIM cards

## II. METHODOLOGY

The work in this paper focusses on controlling the motor by using the soft starter. Soft starter provide smoothly starting of the motor, because of the soft starter initial high torque and starting current reduces which is found in conventional starter. Our main objective is reduced starting current, reduced electrical power cost, Wide range of torque and current ratings and Surge current protection for starting conditions.

Precisely there have been used two mobile stations: a receiver and a transmitter. The receiver mobile is always in auto receiving mode. When a SMS is made by the transmitter mobile then the SMS is automatically received the receiver cell phone. Then the transmitter mobile gives a command to the receiver mobile phone. It is seen from the above potion that the microcontroller receiving signal from the signal conditioning circuit operates the relay. Same time the microcontroller sends a command to a signal sending SMS to send a signal to the transmitter mobile station whether the motor is in on or off state.

**A. Water level sensing:** A water level sensor is used to check level of the water in the tank. It will turn the motor automatically on when the water level is high. when the level of the water goes below the threshold level this is sense by the water level sensor ,it send the signal to the microcontroller and automatically off the motor, hence there is no required that come the user and on or off the motor.

III. DESIGN AND HARDWARE IMPLEMENTATION

Basically, the controlling of motor need to be done or ON and OFF the motor at distant places without any human intervention. This is done with the help of GSM module. When feedback is 0 then motor is OFF and when feedback is 1 then motor is ON. According to input given from user motor is ON or OFF. GSM modem SIM900 is interfaced with serial port of controller. It can turn on or off the motor based on message receive by the user. A water level sensor is also used to check level of water in tank. Once the desired speed of motor is achieved microcontroller gives the signals to relays to switch operations from TRIAC to direct AC source.

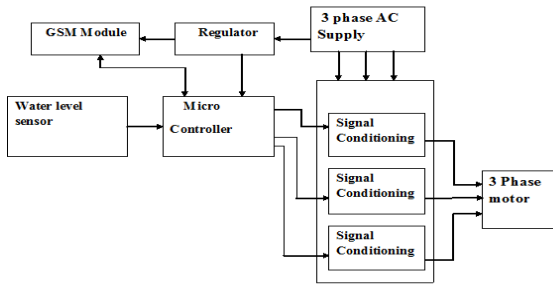


Fig.1. Block diagram of GSM module control

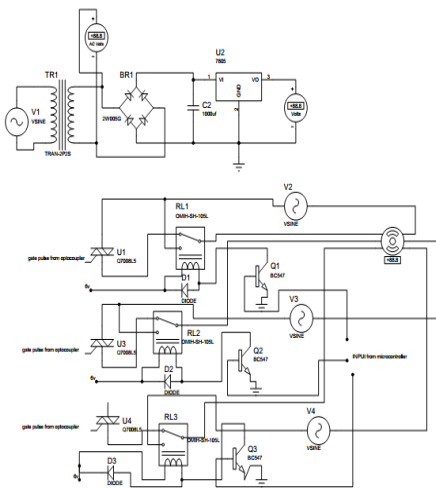


Fig. 2.

Circuit diagram of control of 3-phase I.M

We will implementing Soft starter with help of thyristor. To start 3-Phase induction motor direct source can't send to the gate of thyristor because of high current and torque rating so there is need of some delay in it to gate. To generate delay first it is necessary to detect zero at each phase. After detecting a zero at each phase, 555 timer IC generates the delay. Delayed pulse goes into gate of triac the through opto-coupler to prevent 555 timer IC from high voltages. At each phase one Zero Cross Detector (ZCD) is used. 0 generate delayed pulse with reduced voltage with reduced voltage 555 timer is used at each phase. Zero cross pulse goes into pin 2 of 555 timer IC, output at pin 3 depend upon knob of potentiometer. By varying the knob of potentiometer resistance increase which further reduces the voltage.

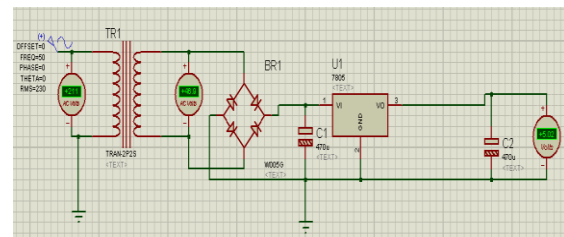
Reduced voltage goes into gate of TRIAC through opto-coupler. Pin 2 is activated on negative pulse from the zero cross detector. Pin 3 operates on 1 and 0(logic states). When it is 0 then “sinking the current” which means it absorb the current into its output and when it is 1 then “sourcing the current” which means it can give out current from output. Due to this property it is used in digital application. 555 timer IC is very stable and give accurate time delay its duty cycle and frequency control through the external elements variable resistance and capacitor. Value of resistance is directly affects the delay. In this work, mono-stable mode of 555 timer IC is used whose time period can be change using external RC (Resistor and Capacitor) elements.

Advantages

- a) Water level sensor that turns OFF the motor when there is no water.
- b) No distance barrier.
- c) Works with any service provider's SIM card.
- d) Power supply unit that will turn OFF the device if any phase disconnection happens.
- e) Runs on 3-phase power supply.

IV. RESULT AND DISCUSSION

Here 230V, 50Hz input is given to the transformer and at the secondary of transformer we get the 12v as output. IC 7805 is Regulated IC which provides the 5V DC output.



V. CONCLUSION

Initially induction motor has high torque & current. By providing soft starter smoothly starting of the induction motor take place. Signal conditioning circuit convert the signal as per input required to the micro-controller. Because of micro-controller complexity of the project gets reduced. By sensing the proper level of water, with the help of water level sensor working of an induction motor take place. GSM modules provide control to the motor from distant place also.

VI. REFERENCES

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