Reverse Recovery of Motor Shubham Mane, Shivraj Mali, Niral Dand

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ABSTRACT - In today's world industrialization is growing very fast, there are many types of industries particularly manufacturing and process industries need three phase induction motor for their process work. Three phase induction motor plays very important role in industries. Reversal of motor is a crucial problem in the industries, normally VFD method is used to control reversal of motor but it is very expensive. By use of few electronic components, we can solve this problem. The use of this project is to to avoid the damages of driven equipment due to rotation in reverse direction. To find optimum and cos effective solution for reverse rotation detector instead of bigger and costly panel, To demonstrate the solution of reverse rotation which we can use for any type of motor or rotating equipment.
Keywords- motor, reverse rotation, control

I. INTRODUCTION

If driven equipment is rotate in reverse direction, then it may cause the damage of driven equipment or the damage the output of the driven equipment. To avoid this we may use this reverse rotation device which is avoid the reverse rotation of 3Ph induction motor which is majorly used in industry by using microcontroller & proximity sensors. This is cost effective solution instead of bigger control panel & we can use same for any type & rating of motor. Electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft. Electric motors can be powered by direct current (DC) sources, such as from batteries, or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters or electrical generators. An electric generator is mechanically identical to an electric motor, but operates with a reversed flow of power, converting mechanical energy into electrical energy

1.1 OBJECTIVES

The objective of the project reverse recovery of motor has 'to protect the motor from rotate in opposite direction'. Main purpose of this project will be to stop motor to rotate in reverse direction. In present time to overcome this situation VFD are used, which are very high priced. In our project we are doing this work in very cost-effective price and easy to operate

II. LITERATURE SURVEY

Author yen-chuan chang and ying-yu tzou presents a new sensor less starting method for brushless DC motors without reversing rotation for unidirectional applications. The method can detect the rotor position at standstill and a specific start-up method is then used to accelerate the motor up to a middle-speed where conventional sensor less control algorithms based on the back- EMF can work properly. The proposed scheme employs only one current sensor at DC-link side of the inverter, and can be applied to a motor without knowing its parameters and additional position sensors. As compared with previous approaches, the presented technique can simplify the sensor less position detection procedure and lower the cost. The proposed initial rotor position detection technique has a resolution of 30 electrical degrees, and does not cause any rotor vibration during the detection process. The sensor less starting scheme has been implemented on a single-chip DSP controller (TMS320LF2407A) and experimental results reveal that the starting procedure can work smoothly without temporarily reversing rotation

Ching-Tai Chiang discusses the influence of reverse rotating field on the vibration of separated phase

induction motor. The sequence circuit model of the separated phase induction motor will be established. In the separated phase induction motor, the series capacitor of auxiliary winding is used to reduce the reverse rotating field. The torsional vibration problem will be solved following the reverse rotating field is eliminated. This paper uses the practical measurement to prove the theory

The Farhan Malik Shaikh use method of proximity sensor (limit switch) and outcome of this study is Boolean logic used has been successfully completed by using this method for dc motor
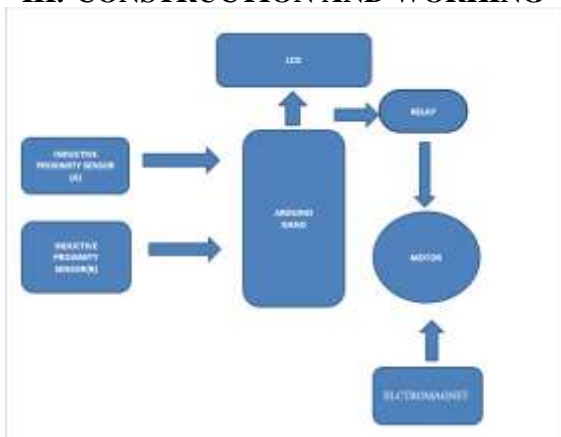
III. CONSTRUCTION AND WORKING

FIG 1. BLOCK DIAGRAM

In this system we will use two inductive proximity sensors they will be placed very close to the motor shaft. The proximity sensor detects the shaft rotation. The output of proximity sensors is given to interspines of the Arduino that is pin no.2 and 3. We will detect the time period between these two interrupts. If the motor moves in clockwise direction interrupt 1 will occurs first and then interrupt 2 will occur after few milliseconds. In case of motor reversal this time will be greater by differentiating this two time differences we can easily find out the direction of rotation of motor. All the calculations will be done by the Arduino microcontroller. We will use Arduino nano for this purpose Arduino uno has six analog input pins and fourteen digital input output pins. We can use the digital input output pins for interfacing a LCD display, the LCD display will show a exact time difference between the two interrupts and it will also show the direction of rotation. If the rotation is in the reverse direction, it will switch off the motor through the relay and the contactors. Otherwise, the motor will remain ON. This will prevent the motor from rotating in the reverse manner and hence the further damage can be minimized. In this study, a method that stops motor to rotate in reverse direction has been developed.

While performing the ARDUINO NANO which acts as a brain of setup gives all commands to each components to perform.

LCD display will show a exact time difference between the two interrupts and it will also show the direction of rotation furthermore arduino gives command to relay for on and off the electric motor in requried conditions. that means if in prossesing the motor in reverse direction then relay will turn off the motor if its in required direction then motor will remian in on condition.formost LCD also provide information about system is in well being condition or not.

Two Inductive Proximity sensor are situated in shaft section of electric motor for sensing the electric motor motion Inductive Proximity sensor A have contineous eye on motor rotating is required direction.Moreover Inductive Proximity Sensor B is placed for to sense,due to any issues if the motor moves in reverse direction then sensor will forwards the information to the arduino nano.On the other hand Electromagnet is implemented to act as a breaking system in reverse direction of electric motor. By locating electromagnet the time is minimised to stop the motor.

3.1 Forwad rotating condition

Under normal operating condition motor starts rotate in forward direction where the LCD display shows motor speed in rpm. In forward operating condition A7 pin of port A of arduino nano connected to relay 1 which operates in clockwise direction of shaft. Furthermore, relay 1 performs mainly to control and ON AND OFF the electric motor.
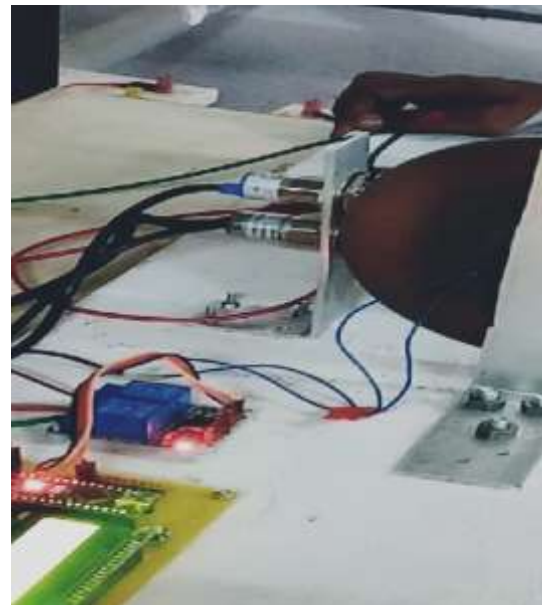

FIG 2. RELAY 1 WORKING CONDITON

3.2 Reverse rotating condition

The conditon where motor rotates in reverse direction then ardunio nano commands to relay2 which is connected to A6 pin of port A in arduino nano.Furthermore, relay2 is connected with electromagnet which is used to stop the motor. While performing we placed electromagnet to minimize time to stop the motor we situated electromagnet and motor in between 8mm distance . despite from this relay2 and electromagnet works only in reverse conditon to stop the motor
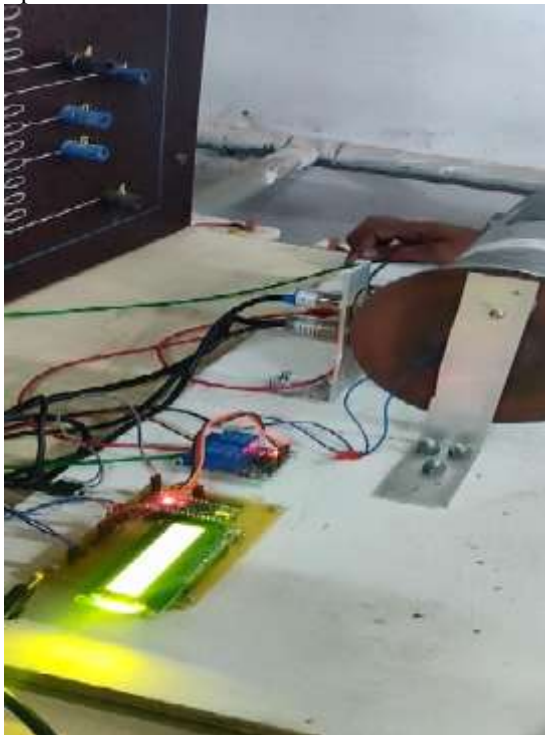

FIG 3. RELAY 2 WORKING CONDITON

3.3 Proximity sensor A and B

All the sensing performance is held by inductive proximity sensors . moreover, proximity sensor 1 is connected to pin D3 of port D of ardunio nano as well as proximity sensor 2 is linked with pin D4 of port D of ardunio nano. Furthermore proximity sensor 1 and 2 senses the speed and the direction of motor . moreover, is shows the rpm on the LCD display as well as it also detect the rotating contion of motor
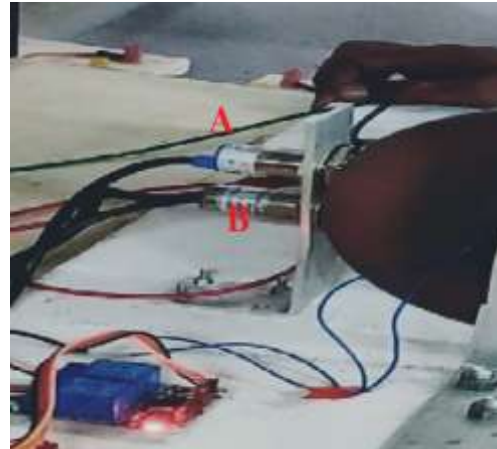

FIG 4. INDUCTIVE PROXIMITY SENSOR A AND B

IV. FINAL SETUP

FIG 4. FINAL WORKING SETUP

V. CONCLUSION

Hence this reverse rotation controller useful to avoid the damages of driven equipment due to rotation in reverse direction. Hence, we have found optimum and cost-effective solution for reverse rotation detector instead of bigger and costly panel. Hence, we have

proposed the solution of reverse rotation which we can use for any type of motor or rotating equipment.

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