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To Design and Develop an Semi-Automated Rotor Winding Cutting Machine for Wind Generator

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Abstract: This project is used to cut the wind generator rotor winding in a semiautomatic manner. Nowadays the rotor winding cutting machine where manually hand operated one in medium and large scale industries, due to this the production and income gain by that industry may get less and also it leads to consume huge manpower and more time to complete the process. In order to overcome this issue, the semi-automatic rotor winding cutting machine for wind generator is needed. This machine consists of motors, conveyor bed, blades, switches, lamps, relays, contactors, limit-switches etc., to perform the cutting process. According to the material to be cut, the cutting tool can be changed. This machine can be widely applied in almost all type of production and assembly based industries, because there the cutting process where concerned most important one. Our project prototype model was initially simulated in PLC Ladder Logic by using INDRALOGIC software and further implemented to the industry in Relay Logic mechanism. The machine is exclusively intended for the mass production and they represents faster and in more efficient way to cut the rotor winding for wind generator. The overall system is compact in size, light weight, modular and flexible to be used in small works jobs who need batch production. The setup overall configuration can be adopted by a semi-skilled worker easily and can vary the operations by making certain small changes. This system has the potential to adopt higher level of automation if desired in future.

Keywords: Motors, Gear-Box, Conveyor Bed, Blades, Switches, Lamps, Relays, Limit-Switches.

I. INTRODUCTION

This is an era of automation where it is broadly defined as replacement of manual effort into an automation. These operations remains an essential part of the system. The automation is of two types, Full Automation, Semi Automation. Both full automation and semi automation has their advantages and disadvantages, but it's important to understand each before determining which best fits your manufacturing needs.

A. Full Automation

A system or method in which many or all of the processes of production, movement, and inspection of parts and materials are automatically performed or controlled by self-operating machinery, electronic devices, etc. One of the main advantages of full automation manufacturing is that it allows for a reduction in headcount (machines replace the need for human operators). With a streamlined robotic process, there is an increase in production rate and improvement in quality. Uncertainty of human errors is eliminated and it's easy to monitor consistency for optimal performance. Through full automation, total quality management is maximized, which fosters reliable processes and systems, resulting in consistent, high-quality products. A fully automated manufacturing process creates economies of scale who allows for businesses to stay competitive, retain good profit margins, and reduce costs. However, one of the bigger disadvantages of full automation manufacturing is the fact that it is difficult to make adjustments to the process. Since each part of the process is heavily intertwined, it can be difficult and costly to make adjustments. In addition, with any machine comes maintenance, and the generally the larger the machine the more costly it is to maintain.

B. Semi Automation

Making a particular function/part of a process easier and faster, but still involves human interaction. In semi-automated processes, part of the task is automated, while the end part of the task involves human operation. One of the main benefits of semi-automation is the mix of human productivity with machine productivity. In semi automation manufacturing, the process is part-machine and part-human, which is a good combination of machine and human input. A process that is not automated at all can be quite time-consuming, but with the help of a machine, the production time is greatly reduced. With the human brain being part of the automated process, it provides the opportunity for continuous improvement. Since only part of the process is automated, particular aspect of the process can easily be improved or changed to fully optimize production. With full automation, once you purchase a large machine, it's difficult to modify a function. However, in semi-automation manufacturing, as long as control is kept over the sequence

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of tasks and how they are performed, it will be easier (and less costly) to change a function. Although it is convenient that semi-automation manufacturing is composed of multiple steps and makes it easier to control, it also makes it more complex. In order to make sure each step of the process runs smoothly and at maximum production, it does require more time to plan out. Each step must be perfectly in-sync with the next in order for operations to run smoothly. It is important to keep in mind that with a human role in the process also comes greater risk of human error.

II. PROBLEM DEFINITION

In order to design and developing a model showing the concept of semi-automated rotor winding cutting machine for wind generator by using a relay logic mechanism incorporating the D.C. Motor.

III. SYSTEM DESIGN

This project is to control the DC Machine using relay logic (limit switches). Now a days most of the conveyor bed required both forward and reverse direction. Here the 24V DC power supply circuit is used to provides supply for DC Motor. In this operation two loading points are there one is for forward loading point and another one is reverse loading point. Two limit switches are used, one is for reverse direction rotation and another is for stop the DC motor, lamp indication. Initially the motor will run in forward direction, when it touches the limit switch 1, the timer gets on and it delay for 10 seconds and then motor will operate in reverse direction. After touching limit switch 2 the motor will stop its operation. By these principle we can able to control the direction of conveyor bed. The rotor winding cutting machine is placed upon the conveyor bed, so by changing the direction of the conveyor belt, the rotor winding cutting process can be done.

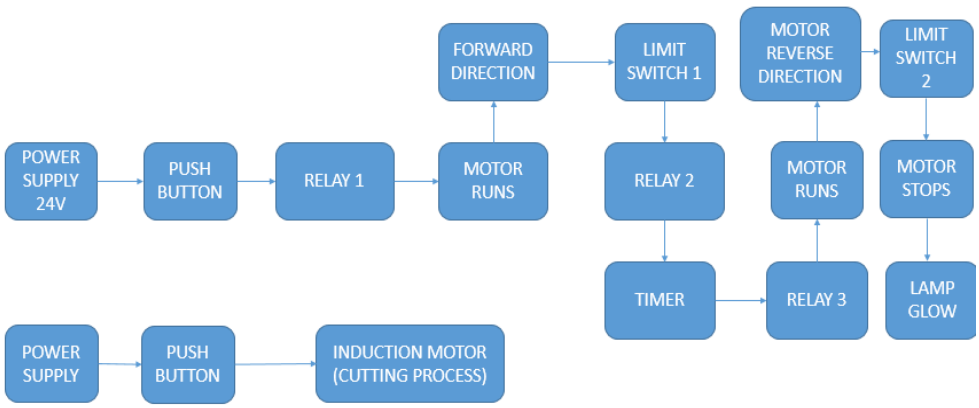

Fig. 1 Block diagram for semi-automated rotor winding cutting machine for wind generator

IV. SIMULATION RESULTS

The control logic has been simulated using PLC Simulation Tool. Ladder logic has been written and verified for the control of relay. The relay has been used to control the machine by ON/OFF once it reaches the desired point.

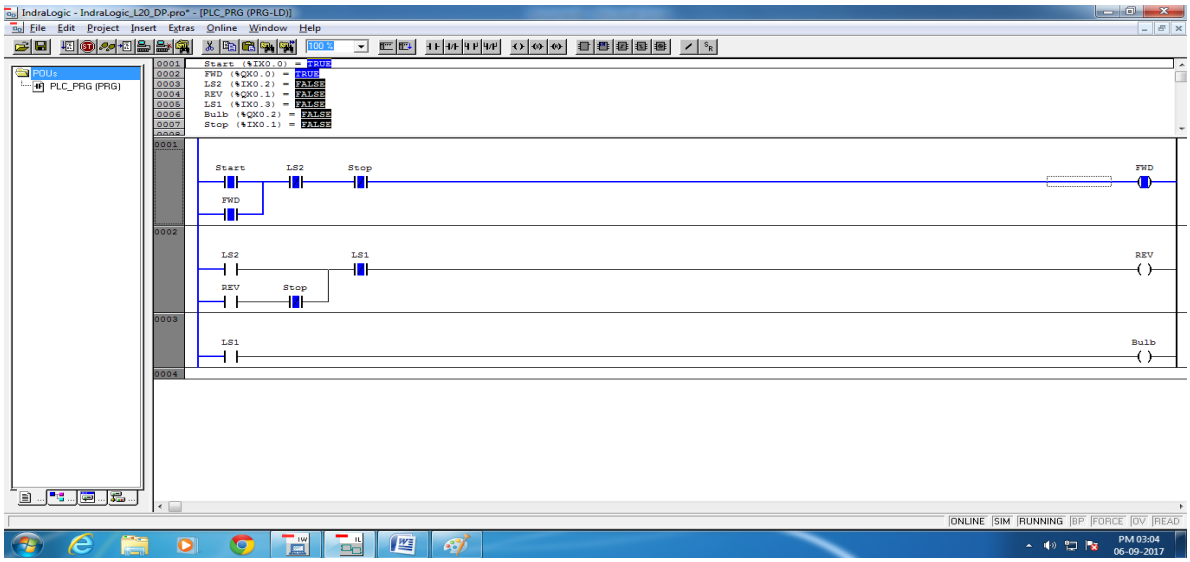

Fig. 2 Simulation diagram for motor forward direction in plc.

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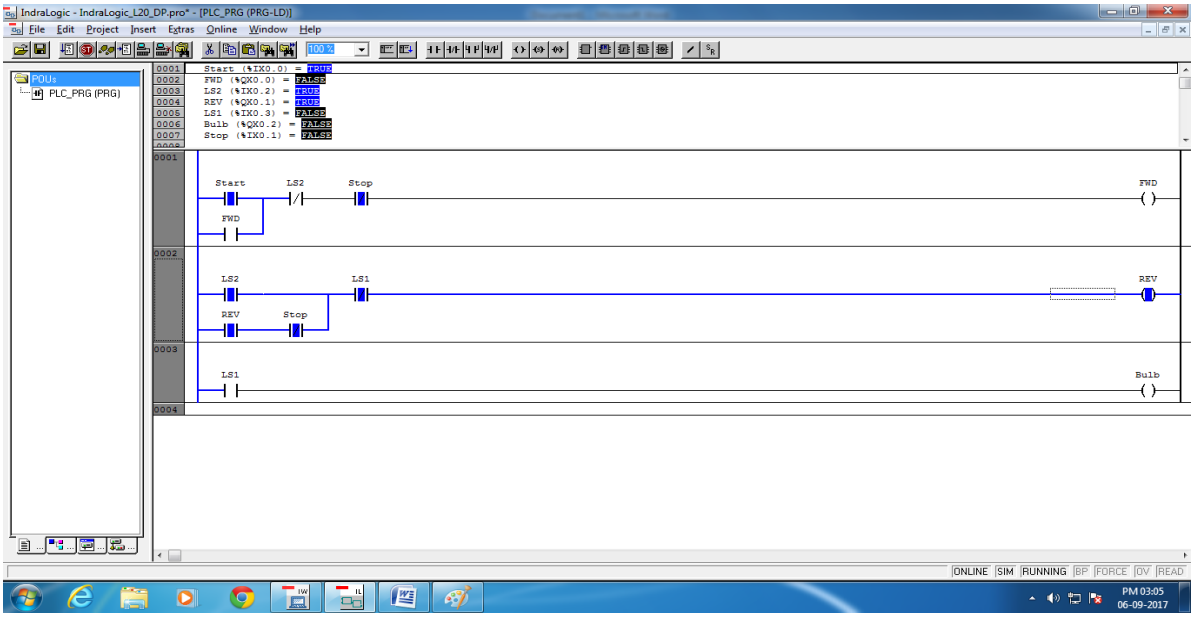

Fig. 3 Simulation diagram for motor reverse direction in plc.

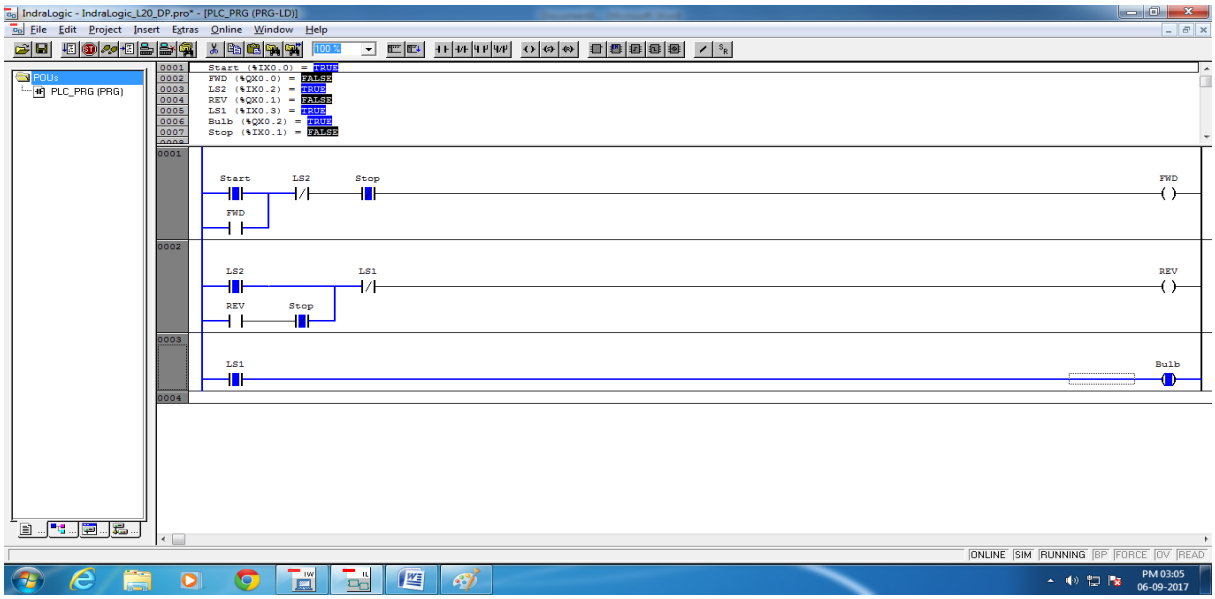

Fig. 4 Simulation diagram for lamp indication in plc.

V. HARDWARE SETUP AND IMPLEMENTATION

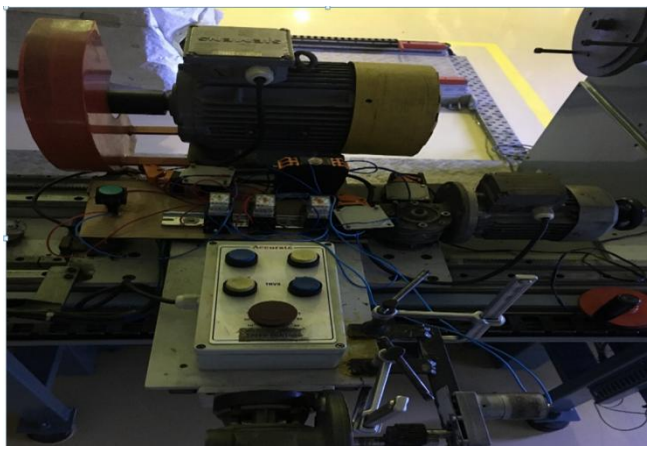

Fig. 5 Hardware output results for semi-automated rotor winding cutting machine for wind generator.

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VI. CONCLUSION

Relays control output circuits of a much higher power. Safety is increased. Protective relays are essential for keeping faults in the system isolated and keep equipment from being damaged. Here we are obtaining the result as working of dc motor in both forward and in reverse direction. Major advantage of this research is only by sensing the materials it will work, it will save the electricity and man-power.

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