AUTOMATION OF DUPLEX MILLING MACHINE BY USING PLC

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Abstract

The research paper presents a concept which saves a labour cost and increases the operational efficiency. Wherein the manufacture of duplex milling machine by using PLC has designed and can be manufactured in special purpose milling machine.

Software requirement:

1. FBD Software
2. Ladder software

FUNCTIONAL BLOCK DIAGRAM

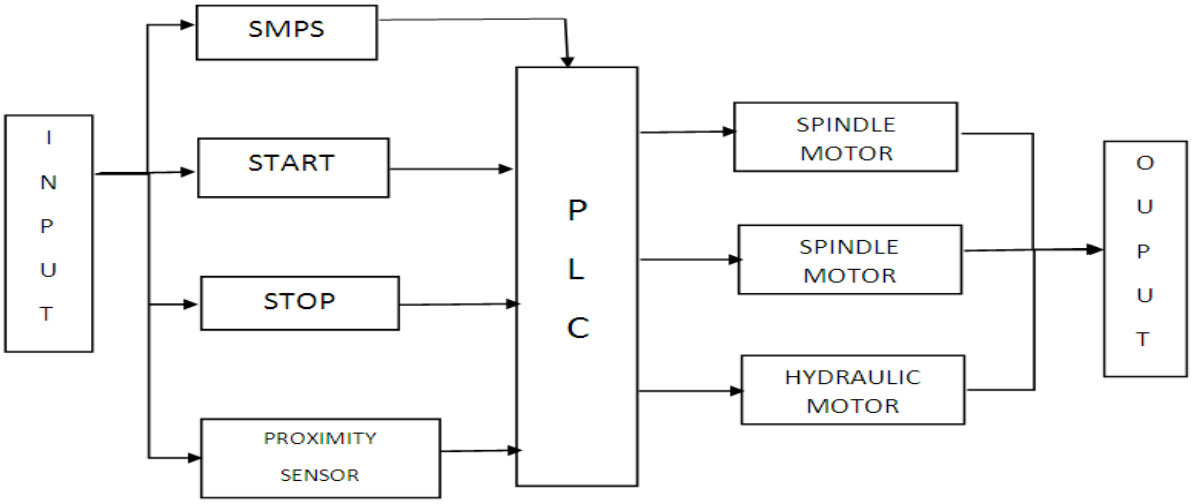

Figure1 – Functional Block Diagram

The above block diagram shows that the input is given to the this Block diagram we have input output, SMPS, Start and Stop push buttons, proximity sensor, PLC, Two Spindle motor and Hydraulic motor. We are giving input to PLC through SMPS, start and stop switch and proximity sensor. SMPS is a switched mode power supply SMPS circuit is operated by switching and Proximity sensors detect magnetic loss due to eddy current that are generated on a conductive surface by an external magnetic field. PLC is connected to two spindle motor and hydraulic motor. Spindle is a rotating axis of the machine. Spindle motor is used to rotate the tool of the machine which iscontrolled manually in present but we are also going to control by using PLC. The hydraulic

motor is the rotary counterpart of the hydraulic cylinder as a linear actuator. It is used to control slider which carries actual job.

LADDER DIAGRAM

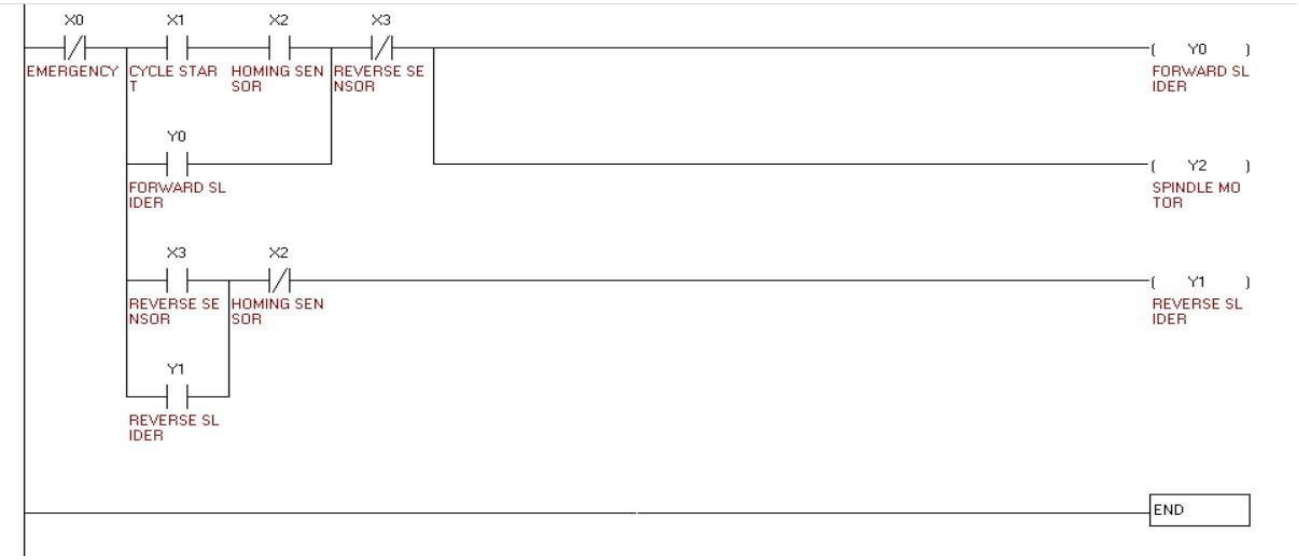

Figure2 – Ladder Diagram

Working of ladder diagram

In this ladder diagram vertical lines are called rung or power lines are and horizontal lines are called rails. Here there are two switches N0 and NC. N0 switch means normally open and NC switch means normally closed switch. In this diagram we have X0, X1, X3, X4 switch all of these are used for

X0 switch is normally closed switch which is used for emergency closing.

X1 switch is normally open switch which is cycle start switch used tostart the cycle

X2 switch is normally open which is homing sensor or reverse sensorX3 switch is normally closed is a reverse sensor switch.Y0, Y1, Y2, Y3 are outputs for motors for forward and reverse operations. Here X0 is NC, X1 is no contact supply get connected to Y0, Y2 that is spindle motor and they start running in forward direction. Also slider is going in forward direction. Then after work done reverse sensor get activated and slider start running in reverse direction.

PLC Inputs: The PLC input is used to detects the status of input signal such as push buttons, switches, sensors. Here X0, X1, X2, X3 these all are input switches.

Emergency(X0)- In case of sudden fault condition system gets off because of Emergency input.

Cycle start(X1)- To start the cycle.

Homing sensor(X2)- Used for sense the signal for forward operation.

Reverse sensor(X3)- Used for sense the signal for reverse operation.

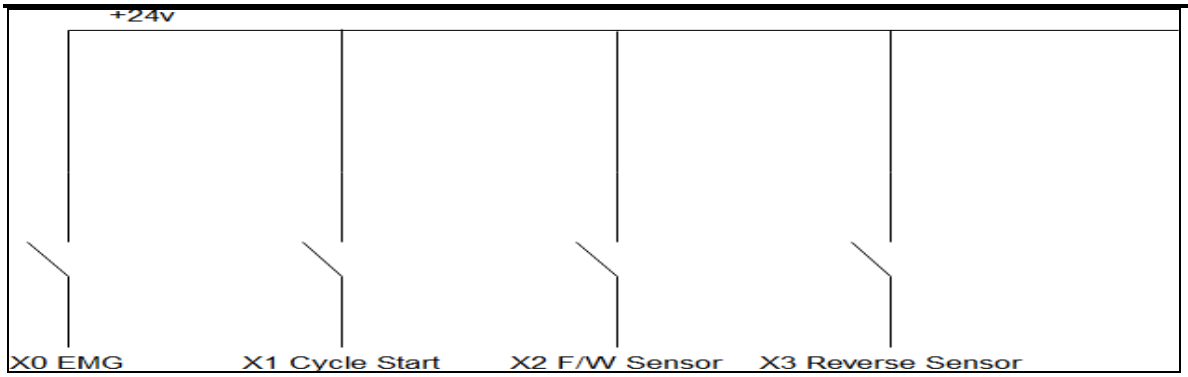

Figure3 – PLC input

PLC Outputs: -PLC output controls devices such as relays, lights. Here Y0, Y1, Y2, Y3 are Output switches.

Slider forward (Y0) - It is used for moment of slider from backward to forwardposition.
Spindle motor1&2(Y2) - This are two spindle motor. It is used to forward and reversemoment of tool.
Slider reverse (Y1) - It is used for moment of slider from forward to backward position.

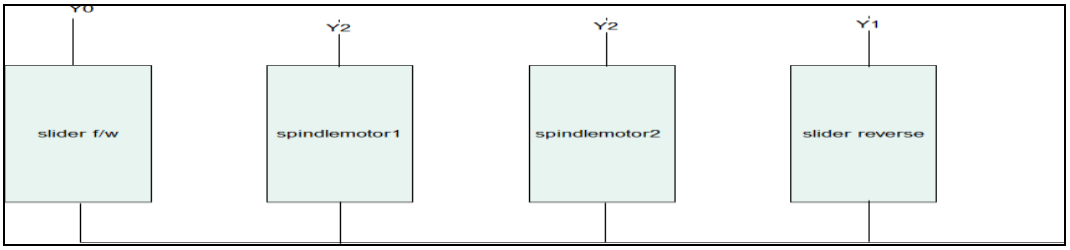

Figure4 – PLC Output

PLC Input

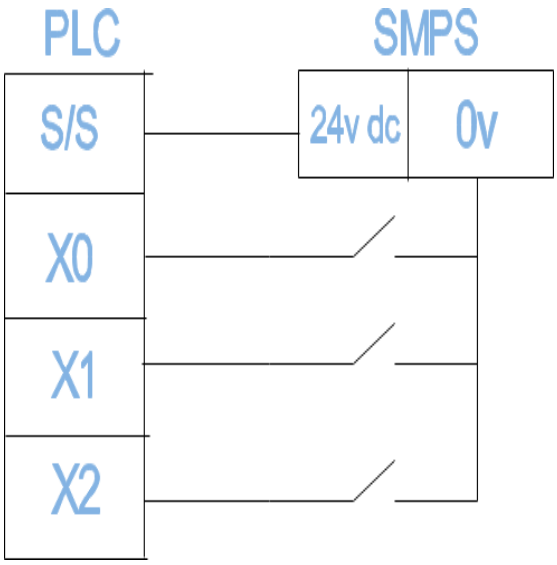

Figure5:PLC Input Wiring-Source(+ve)

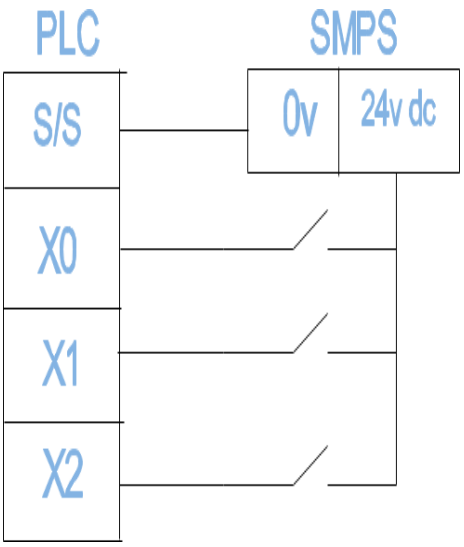

Figure6:PLC Input Wiring- Sink(-ve)

Types of PLC Input

Source (+ve)

This type the input is positive which is given by the NPN type of the Relay. As shown in the figure1 positive +24v is given to the S/S of the PLC. Which gives the steady supply to the inputs of the PLC. The -ve of the power supply i.e. the 0v is made common to all the input switches or push buttons

Sink (-ve):A sourcing input or output provides the voltage source for the electric load .Sink type of the wiring uses the negative inputs. Especially if there is PNP transistor is used then then this type of connection is used. The 0v which is negative of power supply is given to the S/S of the PLC and -24vdc is made common to all the inputs. Here we can use the NPN relay because relay gives the +ve and -ve both output. Input and output points that are sinking or sourcing can comportment current in one direction only. This means it is possible to connect the outward supply and field device to the input ,output point, with current trying to flow in the wrong direction, and the circuit will not operate.

PLC Output-

The output wiring is same as the input but the change is C0 bit. Which is connected to 24Vdc of power supply. And the negative is made common to all the output equipment as shown in figure.

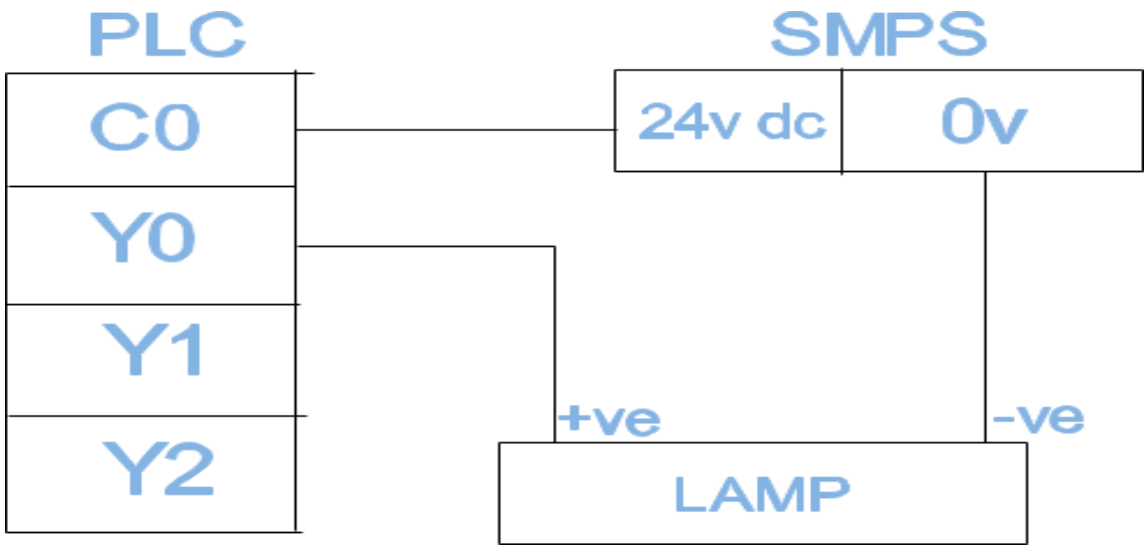

Figure7. PLC OUTPUT WIRING

WORKING OF PROJECT

When we press cycle start switch then three motors two spindle motors and one slider motor are started running in forward direction that is slider moves in forward path .When slider travels in forward direction job on which we have to do work is fitted in between two spindle motors. The cutter is connected on this two spindle motor when job is going forward in between these two motors it is cutted and the slider is going forward till it reaches at limit switch. After slider reaches at limit switch the limit switch is pressed and motor are started running in reverse direction that is slider moves in reverse direction till it reaches at initial position and the job work is completed This cycle is repeated.

CONCLUSION

From this project we can increase the productivity, accuracy from special purpose machine. And decrease the labour cost, manual work and time. It is most efficient and protective from accidents which may occur from manual work. It is long lasting and it save the electricity.

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