

# Automatic Box Packaging by Using PLC Automation

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## ABSTRACT

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**ABSTRACT**—Rapid development of recent mechanization and automation of packaging technology with every passing day, the quantitative packaging of assorted things ought to be correct and this contains a direct impact on the survival and economic advantages. In recent years, in trade the load of the roles area unit checking then faulty jobs area unit rejected manually. However currently a days we will check the load of the item victimization the automation (using Load cells) technique and faulty jobs rejected victimization PLC and correct jobs pass to any method on the belt. In trade the assembly speed ought to be high as a result of demand of the merchandise is a lot of. However after we check the load of the item manually then can it'll take longer for checking the load and overall speed of the assembly will decrease. In trendy globalization, several technologists are attempting to update a replacement development supported automation that works terribly stiffly, high effectively and inside short period of time. The progressive invention in motor vehicle deliberation system is turning into a very important task particularly due to rising demand of merchandise and declining labor accessibility in trade. The aim of the study is to interchange the manual system getting used within the trade, compare the time, and workforce demand for each the present system with the projected machine-controlled system.

**KEYWORDS:** Programmable logic controller PLC (Siemens)

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## I INTRODUCTION:

Nowadays, automation in the industry becomes the global trend in manufacturing and with the success of the Japanese and European industries in terms of production; more and more companies are switching to automation. Automation is certainly the watchword as today's manufacturers face razor-thin profit margins, Just-In-Time (JIT) manufacturing and the ISO-9002 quality standards. Companies must automate in order to deliver what today's customer is demanding when he wants it and at the price he wants to pay. In product manufacturing industry, packaging plays an integral role. Packaging of a product determines its quality. To get a review of packaging systems we have visited following places. Chitale Milk and Milk Products: Chitale has also kept pace with modern times in terms of product innovation, specialties and use of automated techniques in production & management. An example of

the same is the branch at Sangali which has an automated system of Japan make where automation lies from production to taping the final product. Using a simple mechanism the system is designed to manufacture the dairy items, making various sizes boxes, filling the boxes with various items manufactured and then final taping of the box. The only drawback of this system is that the packing of the filled box is done manually. Actual work of closing the flaps of the box is done by workers and then the box is fed to the taping assembly. The operation of taping is fully PLC controlled and is the most efficient and reliable system. Due to increased complexity of the system the packaging is kept manual. It provides the classical advantages of automation: time and accuracy. Standards for CAD transmissions have been developed such as IGES and STEP.

### 1.1 Problem Statement

The use of Programmable Logic Controller for Sophisticated Industrial Box Packaging by using various components like various types of sensors, Low DC motor and Conveyor belt.

### 1.2 Objectives

1. The main objective of the proposed work is to present the advantages of using automated packing machine which can automatically pack various products and to check its performance.
2. Development of fully automated packing machines keep cost factors such as space and personnel at a low level.
3. This helps in reducing the total cost of the project.

### 1.3 Scope

Implementation of this project in various small scale industries for packaging boxes and reduces the human effort as well as human labor and reducing the estimation cost of the product and time saving process.

## II. PROPOSED SYSTEM

### SYSTEM DEVELOPMENT

The present work is planned to design and developed PLC (Siemens) for box packaging. The main parts of the system is given below

**Different parts of system design are given below:**

- a) Limit Switch
- b) Direct Current Motor (DC Motor)
- c) Sensors
- d) Conveyor belt

The details of above mention parts are discuss below:

#### a. Limit Switch:

Terminal A is normally closed i.e. when relay is off, the common terminal (pole) is connected to A. We are using 12v operated and SPDT relay. When current flows through the coil, magnetic field is generated and pole is attracted towards terminal B. And when flow of current through coil stops, pole connects back to terminal A. So to make relay ON and OFF we need to control the flow of current through the coil. is shown in **Fig. 1**.

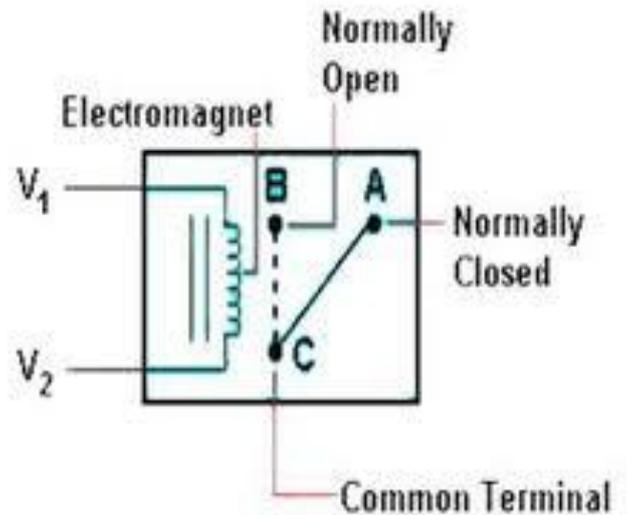


Fig. 1 Schematic diagram of Limit Switch

#### b. Direct Current Motor (DC Motor):

Robotic arm motions are used to close the flaps of the box and to move conveyor belt. All the arms are directly driven by motors. Eight motors are used to control conveyor belt motion and arm motion. Out of eight motors, two are used for conveyor belt movements which are unidirectional and remaining six are used to close the flaps of the box. Out of the six motors, two are unidirectional and four are bidirectional. All the motors are brushed direct current (DC). The motors are having internal gearbox which is used to control the speed. Depending upon the gear ratio, standard speeds are available. Some of the speeds are 30rpm, 60rpm, 100rpm, 150rpm, 300rpm, 1000rpm etc.

#### c. Bidirectional motor driver:

Out of four robotic arms, two are bidirectional and two are unidirectional. To control the motion of two bidirectional arms from PLC, an L293D driver is used. This is a medium power motor driver perfect for driving DC Motors and Stepper Motors. It uses the popular L293D motor driver IC. It can drive 4 DC motors in one direction, or drive 2 DC motors in both the directions with speed control. L293D is a dual H-Bridge motor driver, so with one IC we can interface two DC motors which can be controlled in both clockwise and counter clockwise direction.

#### d. Block Diagram:

The block diagram of Box packaging is shown in **Fig. 2**.

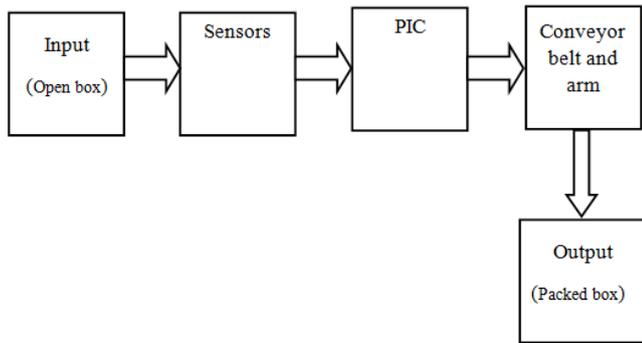


Fig. 2 block diagram

## 5. Description:

### 5.1 Input:

Input to the system is an open and filled box. The assembly is designed for fixed size of box, but by slightly modifying it we can use the same for different sizes of box. Box is used to do its packaging. Which is main aim of our project.

### 5.2 Sensors:

Generally sensor is called as heart of any system. It is the most important part of system. The sensors block consist of limit switch and position sensor. Limit switch is a simple mechanical switch. The switch can be used to detect whether the box is full or empty. If the placed box on conveyor belt is full then sensor gives high output otherwise the output is zero. Another sensor is used to detect whether the box is placed correctly or not on the conveyor belt. That sensor is position sensor.

#### a) Limit Switch:

Terminal A is normally closed i.e. when relay is off, the common terminal (pole) is connected to A. We are using 12v operated and SPDT relay. When current flows through the coil, magnetic field is generated and pole is attracted towards terminal B. And when flow of current through coil stops, pole connects back to terminal A. So to make relay ON and OFF we need to control the flow of current through the coil.

### 5.3 Programmable Logic Controller (PLC):

Siemens S7 300 is a modular mini PLC system for low and mid performance ranges. There are 312 to 318 modules. It has around 1024 Digital input output and 38 Analog input output. The programming software is Symatic manager. It is compact but expandable as well as modular PLC.



Fig 3. PLC Circuit

### 5.4 Conveyor belt:

It is used to move the box forward and backward. The conveyor belt used in this project is made up of rubber and it carries groove which is fitted in rotating wheel. The groove ensures that conveyor belt will slip from the rotating wheel.



Fig 4. Conveyer arrangement

### 5.5 Output:

Output will be a packed box. The packing process is done by separate arm/jack which are used to fold all the four flaps of filled box.

## VI. Advantages and Limitations

### 6.1 Advantages

- Increased Production
- Lower Costs
- Accuracy
- Faster Service

### 6.2 Disadvantages

- Malfunctioning takes place in job.

## VII. Conclusion

Technology is quickly changing the way we conduct business, and with that change we must adapt. By adding an automated packaging machine to your line you can begin to upgrade and update your business and start to save yourself money. Packaging may not be something you view as needed automation, but once you try it and see what it can do, we realize that these devices are all to our benefit. If you are interested in increasing your production while decreasing the cost, then this is the path for you. It enables to double or triple your current production. You will lessen susceptibility to costly mistakes in packaging production thru manual handling. At the same time, it is most likely that your production, energy and overhead costs are also minimized. The advantage of having a PLC controlled machine is its fast response, easy maintenance, reliability and cost effective component. Its working speed is worth to be appreciated. Following are the features of automated systems:

- Increased Production:

This system provides fast and precise operations around the clock. By properly maintaining the machinery you can reduce employee and production downtimes as well. Both of these lead to an overall increase in your production numbers and more profit.

- Lower Costs:

It minimizes the errors. Automated packaging machinery offers identical results every time so the whole human error component is not part of the equation.

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