Automatic Auger Filling Machine For Packaging And Sealing Food Grains Using Programmable Logic Controller

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Abstract – Now a day in industries, packaging is a stage that is important because, to make a product safe and good in condition when delivering to customer as well as to both sellers and buyers of the products. Packing is an important process to make the product good in condition. The problems of packing come when company has a demand of the product higher than ordinary. So, the operators that work at packing section must finish before the due date. However, it will make problems like the product is broken or cannot use. Therefore, this project will try to help and improve the packing system to make the process run systematic and make the product good in condition. Screw (Auger) conveyors are widely used for transporting and/or elevating particulates at controlled and steady rates. They are used in many bulk material applications in industries ranging from industrial minerals, agriculture, chemicals, pigments, plastics, cement, sand, salt and food processing. This project will use programming to make the system running step by step by using PLC (Programmable logic controller).

Keywords–Screw Conveyor, PLC, Sensor, Automation

I. INTRODUCTION

All major industries create wealth but if there is one industry that plays a unique role by way of both creation of wealth through a wide range of manufacturing activities and also by way of preserving the wealth or value created by many, many other industries, it is packaging.

Apart from the huge value addition and employment involved in these activities, packaging has served the Indian economy by helping preservation of the quality and lengthening the shelf life of innumerable products - ranging from milk and biscuits, to drugs and medicines, processed and semi-processed foods, fruits and vegetables, edible oils, electronic goods etc., besides domestic appliances and industrial machinery and other hardware needing transportation. With water becoming a consumer product, polymer material-based bottles are becoming a universal presence.

Packaging, as distinct from mere “packing”, plays its most visible and catalytic role in a modern economy with the widespread adoption of branding of products and development of consumer preferences. To the extent that any consumer product is packaged in a manner that meets the criteria of safety, convenience and attractiveness, it gains market share. In the aggregate, packaging as a sectoral activity boosts consumption and economic growth.

Packaging technology can be of strategic importance to a company, as it can be a key to competitive advantage in the food industry. This may be achieved by catering to the needs and wants of the end user, opening up new distribution channels, providing a better quality of presentation, enabling lower costs, increasing margins, enhancing product/brand differentiation, and improving the logistics service to customers.

The packaging industry’s growth has led to greater specialization and sophistication from the point of view of health (in the case of packaged foods and medicines) and environment friendliness of packing material. The demands on the packaging industry are challenging, given the increasing environmental awareness among communities.

Packaging is the science and technology of enclosing or protecting products for distribution, storage, sale, and use. Packaging also refers to the process of design, evaluation and production of packages. Packaging contains, protects, preserves, transports, informs, and sells. It is fully integrated into
government, business, institutional, industry, and personal use.

In industrial now a days, packaging is a stage that is important because to make a product safe and good in condition when delivering to customer as well as to both sellers and buyers of the products. Most commercial packaging serves two basic functions which are protecting the product from damage during shipping, and promoting the product to the ultimate consumer.

II. OBJECTIVE

The main objective of the project is to Design and Develop an Automatic food grains filling and sealing to bags of different weight with PLC Integration. Programming the system in PLC ladder logic diagram. To develop a filling machine which can fill different sizes of bags on the bases of loads same principle can be used in different industries like medicine, agriculture, plastics, cement, pigments, salt, chemical industries for filling grains to different sized component by one machine.

III. PROBLEM DEFINITION

The problems of packaging machine nowadays are when company has a demand of the product higher than ordinary. So, the operators employed in work at packing section must finish before the due date. However, it will make problems like the product is broken or cannot use. And also the expensive because the component and the material that they use are of a high quality. Therefore, the prices make a factor to them to buy the machine. The sizes of the machine also take a lot space in the factory. So, they must arrange the component and equipment in the factory before buying the machine. Few factories are using operator or human to package the bags. However, the problems that occur from operators are they will take time to package a lot of bags. So, the customer must wait and order a few quantity of product it they want the product early.

The size of the Indian packaging industry is 14.7 billion dollars. Packaging machinery manufacturers in India find most of the demand for their products in the food processing and pharmaceutical sectors. Approximately 45 percent of the packaging machinery and materials produced is absorbed by the food processing sector alone, 25 percent for pharmaceuticals, 10 percent each for personal products, tea and coffee, industrial products industries. The Indian market for packaging equipment is expected to grow at an average annual growth rate of 10 percent over the next two years. Imports of packaging equipment to India are currently over 130 million dollars.

IV. METHODOLOGY AND EXPERIMENTAL SETUP

There are several hardware elements which are used in design of a packing assembly. These are responsible for the motion of each part at each station. This is arranged orderly and fabricated to obtain final assembly.

The hardware components used in this project are as Regulated power supply, 12 VDC Relay SPDT type, DC Geared motor, Transformer, PU tube, Plastic screw conveyor, Load cell, Impulse Poly Bag Sealer, PU tubes and connecting wires and cables.

The experimental Setup consists of all assembled parts with effective hardware elements with an integrated sensors and actuators. The sensors used will be load cell for measure the accurate weight.

The basic block diagram (as shown in FIG. 1) of the process and its explanation is given as follows

![Fig. 1 Block diagram of the automatic auger filling machine.](image)

The food grains (rice) are stored in the hopper; the bags are kept at the position. Switch on the motor which is coupled to the screw conveyor. The movement of food grains takes place from hopper to container through screw conveyor. As soon as container gets loaded, load cell senses. The required quality after that motor will stop. The food grains are filled to the bags from container. Finally filled bags are sealed through sealing machine automatically with the help of programmable logic controller.

V. RESULT AND DISCUSSIONS

The experiment demo consists of a screw conveyor which is coupled to the motor. This results in control the flow of material in processing operations which depend upon accurate batching. Which increase the accurate filling of food grains due to which the increase of production rate. There will be no idle time in between during handling of filling compare to manual handling. In manual handling the filling is operated by human and
human can handle 2 filling bags at 1 cycle and total idle time will be 30 seconds but where as in automation within 15 seconds can be achieved. This reduces overall manufacturing lead time and around 15 seconds can be saved in each cycle. The automation systems will have high precision and repeatability.

VI. CONCLUSIONS

There will be reduced Manufacturing Lead Time due to less idle time. This can be achieved by implementing automation to existing systems. Finally a firm can achieve higher production rates and product quality with greater precision and repeatability.

A less operator intervention is obtained in this project; this is very effective in case of handling hazardous materials or liquids. Especially in pharmaceutical and chemical industry packaging automation will avoid many humans to handle hazardous components. This will be done by automation machines.

VII. REFERENCES


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