

DEVELOPMENT OF BOTTLE UNSCRAMBLE MACHINE

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Abstract - Automation is use of control system and information technologies to reduce the need for human work in the production goods and services. In the scope industrialization, automation is a step beyond mechanization. Whereas mechanization provide human operator with machinery to assist them with the muscular requirement of work, automation greatly decreases the need for human sensory and mental requirement as well. Unscrambler is the most common automation device that is used in industrial field for product sorting system. In purposed project unscrambler is used for sorting of bottle system. Packed mineral water is become preferred choice for huge mans of people to cop up the demand of it complete automation is need. There are many automation system is exist for packed mineral water but that all are very costly. Due to more cost of automatic system industry are use the manual process. My proposed work for proper positioning of the bottle is cheap & maintenance free. A conveyor belt is the carrying medium of a belt conveyor system. A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or more pulleys with an endless loop of carrying medium—the conveyor belt—that rotates about them.. The conveyor belt are rotated by the gearing mechanism which is located at the side end of the wooden frame .This gearing mechanism is attached with DC motor for movement for wheels. Then on the conveyor belt bottle automatically placed in the vertical position

Key Words: Bottle, Automation, Drum, Unscramble Machine

1. INTRODUCTION

A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the transportation of heavy or bulky materials. Conveyor systems allow quick and efficient transportation for a wide variety of materials, which make them very popular in the material handling and packaging industries. Many kinds of conveying systems are available and are used according to the various needs of different industries. There are chain conveyors (floor and overhead) as well. Chain conveyors consist of enclosed tracks, I-Beam, towline, power & free, and hand pushed trolleys. The belt conveyor system is designed with high degree of automation, loading, movement and unloading efficiency.

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The objective is to reduce the man power and increase the efficiency. It also eliminates the electric sensor and robotic arm which is used for the vertical position of the bottle. Main objectives of this research are reduced human resource and make it automatic. So that it can increase production rate.

2. RELATED WORK

Bipin Mashilkar, Pallavi Khaire, Girish Dalvi (2015) has investigated Automation system for bottle filling. The field of automation has a notable impact in a wide range of industries beyond manufacturing. Automation plays an increasingly important role in the world economy. Filling is a task carried out by a machine that packages liquid products such as cold drinks or water. In past, humans were the main method for controlling a system. More recently, electricity has been used for control and electrical control is based on microcontrollers for various purposes like medicines, pharmaceutical plants, chemical plants etc [1]. Sagar T. Payghan, Rani H. Deshmukh, Puja P. Magar, Vinod M. Manure (2016) has investigated Automation of Bottle Filling Plant with Industry. In the bottle filling plant various processes need to be controlled and monitored regularly. Thus it becomes tedious job to handle the plant manually. PLC automates the sequence of operation to avoid human interference so accuracy is improved and speed of process has been increased [2]. Kunal Chakraborty, Indranil Roy, Palash De (2015) has investigated that controlling the process of bottling plant using PLC and SCADA. This paper presents basic stages of operation of a bottling plant, i.e. the filling and capping process. The main aim of our paper is to control the filling and capping section of a bottling plant simultaneously [3]. Vijay. B. Sutariya, Shivang. S. Jani (2015) has Designed Unscramble for Bottle Packaging. Automation is use of control system and information technologies to reduce the need for human work in the production goods and services. Unscrambler is the most common automation devices that being used in industrial field for product sorting system. [4]. Mallaradhya H M Et al, "Automatic liquid filling to bottle of different height using programmable logic controller". Traditional methods of bottle filling involved placing bottles onto a conveyor and filling only one bottle at a time. This method is time consuming and expensive. The

present work briefs about a machine that used to prepare automatic filling of liquid into the bottle of different height is fully controlled by the PLC which acts as the heart of the system. Sensor usually plays its vital part as an input signal transmitter for the PLC in the system. During this work sensor has been used to detect the bottle position that move along the conveyor belt at the low speed while the machine operates. The input signal that has been sent from the sensor to the PLC has being made as a reference. The entire system is more flexible and time saving.

2.1 PROBLEM IDENTIFICATION

Many Small companies today are still use the manual sorting process to sort the part for production process, by using simple unscrambler. Simple unscramble consist turn table, it can be take long time to finish the work because human will usually feel bored and tired to do same task repetitively. This situation will result to inefficient work condition for the worker. The repetition of this work over long period of time can expose the workers to experiencing lower back pain and some cases of musculoskeletal disorder

3. DEVELOPMENT OF SETUP

Based on the literature review present work is concentrated on development of bottle unscramble machine. First of all we started with the preparation of structure, then we had done marking according to the required size. After the marking cutting of the entire solid angle plate as per the marking on them was taken place.

Then a hole on the wooden frame by using drilling machine was made, on which we had done machining. After then we had stuck the car parts like gear attach with DC motor, lead screw with the DC motor.

Then we had completed the conveyor mechanism by adding the lead screw mechanism to increase or decrease the size. Wooden plates were then joined by using adhesive material. In the last whole conveyor system is attached to the drum which is very important part of the system from which bottle is passed to the conveyor.

The conveyor belt are rotated by the gearing mechanism which is located at the side end of the wooden frame .This gearing mechanism is attached with DC motor for movement for wheels.

The scrapper which is made off of the wooden is helps in stopping the bottle which is go to the conveyor. Then on the conveyor belt bottle automatically placed in the vertical position. Due to this mechanism we increased the productivity as well as efficiency of the work and decreased the errors which is made during the manual operation.

In view of all the considerations discussed above, the scheme of proposed setup has been shown in Figure.



Fig. 1 Drum



Fig. 2 Conveyor



Fig. 3 Bottle Unscramble Machine

Due to the bottle unscramble machine the position of the bottle is vertical on the conveyor belt at the end so we also used this machine for the bottle filling process as well as bottle packaging system in the industry.

For that at the end of this machine two rods of metal is connected where the conveyor belt is ended and the distance between two rod is the similar distance of upper portion(or width of the cap) of the bottle at which the cap is fitted.

This two roads take the bottle to the another conveyor which is used for the bottle filling machine and after the completion of the bottle filling process the bottle is going for capping and at the last it is going to pack. This is another use of the bottle unscramble machine rather than the bottle sorting.

3.1 DESIGN CALCULATIONS

1. Belt Dimension, Capacity and Speed:

$$(1) V = D \times \Pi$$

Where:

V= Belt speed;

D= Diameters of rollers; and

$\Pi = \pi$

Capacity is the product of speed and belt cross sectional area generally, belt capacity (kg/sec) is given as:

$$(2) B.C. = 3.6 \times A \times V \times \rho$$

Where:

A= belt sectional area (m²);

ρ = material density (kg/m³); and

V= belt speed (m/s)

The conveyor length= horizontal distance / inclination angle θ

2. Roller diameter:

$$(1) n = V \times 1000 \times 60 / D \times \Pi$$

Where:

n= no of revolution per minute;

D= roller diameter (mm); and V= belt speed (m/s)

3. Motor output

$$P_{\text{motor}} = 1.15 \times (T_e \times v) / \eta$$

Where,

T_e = effective tension in KN,

$T_e = (H + H_0) \times (w/S) \times (9.81/1000)$

3. CONCLUSIONS

The whole setup is made of wooden structure so the possibility of vertical position of the bottle is 95% because on the wooden structure the surface finish is not so good as compared to the Stainless Steel. Due to this mechanism we increased the productivity as well as efficiency of the work and decreased the errors which is made during the manual operation.

FUTURE SCOPE

As a future scope, this concept is use in various industries like water bottle packaging plant, pharmaceutical, beverages, cosmetics, and other industries which is use bottle for the product packaging and bottle filling plants.

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