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AUTOMATED CONVEYOR SYSTEM

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Abstract : Present world is very much competitive world. Up growing technology is very much responsible in this case. The nation which have more updated technology, it dominates the world. To survive in the competition technology is very much important. Industry has very much influence on economy for a nation. Where there is industry, there must be production of some products. Technological improvement is very much necessary to industry for better product. Automation is very necessary for industry. Conveyor belt is used to carry this product from one station to another. It is a necessary tool in the production line of an industry. The objects can be sorted in a conveyor belt according to its height. For this purpose, a product will have to be placed on a conveyor belt which is operated by a motor. Then after checking the height of the product, the exact or lower than that height of the products will be thrown to the product box and the greater than the exact height products will be rejected to the waste box by automatic rejection process and the accepted products will also be counted automatically which is performed by user defined rules.

I. INTRODUCTION

It is the era of science and technology. People are making new inventions for their day to day uses. They love comfort, but not in the cost of quality. So man thinks of something new which is easy to use but in the same time it can prove itself useful. Nowadays industries are playing a vital role in the national economy .So it is very important for an industry to maintain the quality of the product they produce. At the same time it is also a disgrace for an industry if their product is not accepted by the customers. Many industries need to produce various types of product at various types of range. Taking this matter under consideration this paper proposed a method which would be very useful for industries. The scope of this method is huge in modern manufacturing industries. It gives knowledge about the different branches of science and technology. Two sectors of engineering science are widely used to materialize this idea.

They are-

1. Mechanical Engineering

2. Electrical and Electronic Engineering

The development of manufacturing industries is dependent upon research in manufacturing process and innovation in new products. The countries that have higher manufacturing rate are known to be developed whereas those with little manufacturing are considered underdeveloped During processing, the raw material gets transformed into product. Once this product gets processed it earns a value for sale. Therefore, manufacturing is ‘adding value’ to the material. The value that is earned by the product should have more cost allowing the organization to make money out of it[1]. Generally, manufacturing industries keep manufacturing same models with little variation in height, color, weight, shape and thus sorting plays an important role here. In old days it was possible to implement manual labor for sorting similar objects. But nowadays due to increased production and for minimizing the labor expenditure for such unskilled task, industries can’t afford human errors for sorting these products. This forced industry to tend towards atomizing the sorting process. As economy has always been a considerable factor in developing industry, thus it become

necessary to develop Low-Cost Automation (LCA) for sorting these products in accurate manner. In automation industry, continuous innovation, finding effective ways to enhance productivity and cut-cost out of operations is the key to success. Burgeoning demand of the automation systems necessitates strategic re-evaluation in the value chain and improving market awareness. Industrial automation mainly focuses on developing automations having low cost, low maintenance, long durability and to make systems user friendly as possible.

AUTOMATION AND CONVEYOR BELT

Automation is the convention of apparatuses, control systems and information technologies to heighten productivity in the production of possessions and conveyance of services. The correct encouragement for applying automation is to increase productivity, quality beyond that possible with current human labor levels so as to realize economies of scale, realize expectable quality levels. In the scope of industrialization, automation is a step beyond mechanization. Though mechanization provides anthropological operators with machinery to assistance them with the brawny requirements of work, automation momentously decreases the prerequisite for human sensory and mental necessities while snowballing load capacity, speed, and repeatability. It is Automation which plays an increasingly imperative role in the world economy and in daily involvement [3].

Automation has had a distinguished influence in a wide variety of industries elsewhere manufacturing. Industrial automation pacts with the optimization of energy-efficient drive systems by precise measurement and control technologies. Nowadays, energy efficiency in industrial processes is becoming more and more relevant. Semiconductor companies like Infineon Technologies are offering 8-bit micro-controller applications for example found in motor controls, general purpose pumps & fans to reduce energy consumption and thus increase efficiency. One of Infineon`s 8- bit product line institute in industrial automation is the XC800 family [4].

Conveyor belt is most advantageous stratagem in industry for various resolution which is computerized. Conveyors are durable and reliable components used in automated spreading and warehousing. In combination with computer controlled pallet handling paraphernalia this allows for more well-organized retail, wholesale, and industrial distribution. It is measured as a laborsaving scheme that allows large dimensions to move rapidly through a process, allowing companies to ship or receive higher volumes with minor storage planetary and with fewer labor disbursement [5].

A conveyor belt (or belt conveyor) comprises of two or more pulleys, with an unremitting loop of material that interchanges about them. One or both of the pulleys are powered, affecting the belt and the material on the belt forward. The powered hoist is baptized as the drive pulley while the unpowered pulley is called the idler. There are two main industrial classes of belt conveyors; those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transference industrial and agricultural materials, for example grain, coal, ores, etc. largely in alfresco sites. Commonly, companies providing general material handling type belt conveyors do not provide the conveyors for bulk material handling [6].

The belt consists of one or more layers of material. They can be made out of rubber. Many belts in general material handling have two layers. An under coating of material to afford linear strength and shape christened a carcass and an over layer baptized the cover. The carcass is habitually a woven fabric consuming a warp & weft. The most communal carcass materials are polyester, nylon and cotton. The cover is frequently various rubber or plastic compounds quantified by use of the belt. Covers can be made from more exotic materials for unusual applications such as silicone for heat or gum rubber when traction is indispensable [7].

Material flowing over the belt may be weighed in transit using a belt weigher. Belts with recurrently spaced partitions, recognized as elevator belts, are secondhand for transporting loose materials up steep inclines. Belt Conveyors are castoff in self-unloading bulk freighters and in live bottom trucks. Conveyor technology is also used in conveyor transport such as moving sidewalks or escalators, as well as on numerous manufacturing assembly lines. Stores often have conveyor belts at the check-out counter to move shopping items. Ski areas also habit conveyor belts to conveyance skiers up the hill [8].

A wide diversity of related conveying machines is available, dissimilar as regards attitude of operation, resources and direction of conveyance, counting screw conveyors, vibrating conveyors, pneumatic conveyors, the moving floor system, which uses reciprocating slats to passage cargo, and roller conveyor system, which routines a sequence of powered rollers to convey boxes or pallets [9].

Rubber conveyor belts are generally used to transport items through irregular bottom surfaces, small items that would fall in among rollers (e.g., a sushi conveyor bar), or bags of product that would sag amid rollers. Belt conveyors are generally fairly similar in construction consisting of a metal frame with rollers at either end of a flat metal bed. The belt is looped from place to place each of the rollers and when one of the rollers is motorized (by an electrical motor) the belting slides crosswise the solid metal frame bed, moving the product. In heavy use submissions, the beds which the belting is pulled over are substituted with rollers. The rollers allow weight to be carried as they decrease the amount of friction generated from the heavier loading on the belting. Belt conveyors can now be factory-made with curved segments which use tapered rollers and curved belting to bear products around a corner. These conveyor systems are commonly used in postal sorting offices and airport baggage handling systems. A sandwich belt conveyor uses two conveyor belts, face-to-face, to firmly contain the item being carried, making steep incline and even vertical-lift runs doable [10].

Belt conveyors are the most commonly used powered conveyors because they are the most adaptable and the tiniest expensive. Product is conveyed directly on the belt so both regular and irregular shaped objects, large or small, light and heavy, can be transported efficaciously. These conveyors should use only the highest quality premium belting products, which reduces belt stretch and results in not as much of preservation for tension adjustments. Belt conveyors can be used to transport product in a straight line or through changes in elevation or direction. In certain bids, they can also be used for static accumulation or cartons [11].

There are numerous types of conveyor belt systems which are classified on the basis on power supply and mechanical setup similar pneumatic conveyor systems, vibrating conveyor systems, flexible conveyor systems, vertical conveyor systems and spiral conveyors, vertical conveyor with forks, heavy duty roller conveyors, and mechanical conveyor belt. For categorization object in industry height sorting system is very much useful. Color and size are the most significant feature for precise classification and categorization of product [12].

II. LITRATURE REVIEW

G. Sujatha et al. [1] gives the information of integrating the sensors with the Programmable Logic Controller and control of the conveyor system using PLC. To control the conveyor ladder logics are used.

Sagar P. Jain et al. [2] designed the conveyor system with varying speed and effective movement of the objects on the conveyor belt using Variable Frequency Drive. Here SCADA is used to monitor the conveyor system effectively.

Kaushal Pratap Singh et al. [3] proposed the conveyor belt design with IR object counting sensor for counting the objects, IR sensing circuit and voltage conversion for energy saving.

K. Ganesan et al. [4] explained about low-cost machine vision system for fault detection using Beagle Bone Black microcomputer board. Hardware is controlled by Arduino micro controller board.

Mingwang Dong et al. [5] applied the concept of less motor operation technique for electricity saving and improvement of the belt conveyor system in coal yard. This technique has the advantages of low cost, stable performance and obvious effect in energy saving.

Slim Abdelhadi et al. [6] used the Gigabit Ethernet network and GigE vision camera to insure seamless integration with in the production line, image processing, fault detection and alarm generation are done on a common work station for real time production monitoring within the bottling chain.

Alhade A. Algitta et al. [7] designed and fabricated automatic packaging machine using PLC successfully, by increasing the production rate and decreasing production time as compared with traditional manual system.

Maitrey Trivedi et al. [8] explained about the closed loop conveyor system using PLC which is capable of stopping the bottle on the conveyor belt at the filling station and a fixed amount of liquid is poured in the bottle using solenoid valve. The input to the plc is given by the different sensors placed at different positions.

N. Keerthipriya et al. [9] implemented the rotating mechanism at the junction of the conveyor belt for directing the objects to the corresponding destinations, by applying this system the time delay is decreases compared to manual system.

K. Kalaivani et al. [10] proposed a PLC based system which can monitor and control grains storage units by considering the factors like control and monitoring of temperature, rats and pests, different size bags to the respective places. SCADA is used for acquiring data and for monitoring overall process.

Ganesh B. Shinde et al. [11] focused on improving the overall production rate by checking the weight of the product on the conveyor belt itself. This can be achieved by implanting the load cell under the conveyor belt and the product is accepted or rejected based on the load cell signal to the controller.

M. Kanmani et al. [12] projected the use of PLC and SCADA for the belt monitoring and control in the thermal power plants. Belt tear up faults, oil level reduction faults, fire occurrence faults are monitored and controlled successfully with this system.

Ashwini T. Sharnagat et al. [13] proposed an intelligent system based on PLC and SCADA for detecting faults like overload condition, alignment of the belt and material flow. Minimum power consumption is done by controlling the speed of motor for the best energy saving system.

Dheeraj Pongallu et al. [14] explaind about the automatic multivariate liquid filling system in which the tank selection can be done using SCADA and conveyor diversion can be controlled by using solenoid flaps.

Satyen Naik et al. [15] designed the system which can prepare the optimized chemical mixtures using PLC for optimizing the efficiency, precision and consistency of the mixture. The entire system is monitored using the SCADA software.

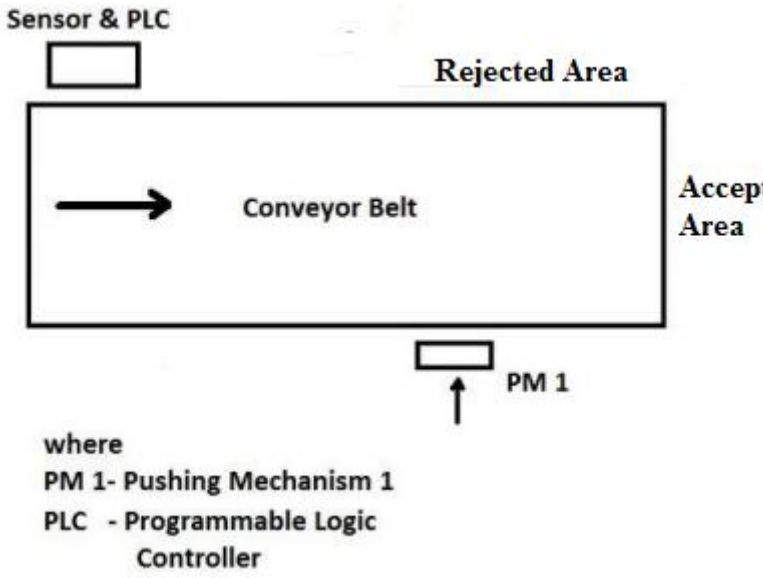
Ashwini Bhiungade et al. [16] gives the concept of automation of conveyor using PLC S7-300 and somatic manager software and explains the advantages of PLC over Relay logic.

Reno Suffi [17] explained about the technology, object detection capabilities, mounting and setup, environmental effects and different applications of inductive proximity sensors.

III. METHODOLOGY

The first step before the project implementation was to review the project scope and research area. Then the next task was to design the mechanical structure of the conveyor belt which is to be built. Then, if all the design had been finalized, the implementation of the hardware and the circuitry took place. Reaching the pick of the project, the programming segment took place especially for the sensor input, sensing process and output to the servo motors in the punching mechanism. Last but not least, certain modification on the circuitry and software took place in order to make the system perform in finer movements. Thus, troubleshooting process also took place to correct certain faulty processes while the system was performing its task.

WORKING PRINCIPLE



The goal of this model is to assert the dimensional (length) accuracy of a product and the rejection of the defective products. For this, first of all an IR sensor is being used which

will ensure the presence of the object. When a product is arrived then the motor starts running and so as the conveyor belt. As the product is on the conveyor belt, due to the motion of the belt it moves forward. The LASER cut the product. As a result, the counter is ON and starts counting. After a while, the LASER cuts the LDR (light depending resistor). So the counter is OFF and stops counting. This time is calculated and is compared with the time which was set earlier knowing that how much time the product will be in contact with the laser. From this a decision comes whether the length of the product is right or wrong. If the length of the product is correct then it is allowed to pass through. At the end of the system there is a sensor which will ensure whether the product is passed or not. If the product passes then the motor stops running and will wait for the arrival of the new product on the other hand if the product is defective (wrong length) then another sensor will ensure the arrival of the defective product in the rejection zone. Then the rejection motor will start and will reject the defective product from the conveyor belt.

IV. EXPERIMENTAL SETUP

To design an **experimental setup for an automated conveyor system**, you need to define a clear objective and assemble components that simulate the real-world working of an industrial conveyor setup.

System Components and Specifications

Sr. No.	Components	Function	Material Used
1.	Arduino	it processes sensor inputs and controls motors, LEDs, actuators, and displays based on programmed logic.	Arduino board
2.	Arduino expansion Sheild	The **function of an Arduino Expansion Shield** is to **extend the functionality of the Arduino board**, making it easier to connect and manage **multiple components**, such as motors, sensors, relays, and communication modules.	electronic components and structural
3.	IR Sensor	The **function of an IR (Infrared) sensor** is to **detect objects, distance, or motion** by using infrared light. In an **automated conveyor system**, the IR sensor is commonly used.	**Gallium Arsenide (GaAs)** or **Aluminum Gallium Arsenide (AlGaAs)**
4.	Conveyor Belt	To move items in a straight or guided path using a rotating belt powered by a motor.	Rubber
5.	PVC pipe roller	To **support and guide the conveyor belt** by rotating along with it, ensuring smooth and efficient movement of materials.	PVC (Polyvinyl Chloride)
6.	DC Motor (12 Volt)	To **convert electrical energy (12V DC)** into **mechanical rotational energy.**	**Steel** or **Iron**

- **Performance Evaluation :**

1) The ability of the conveyor system to move a certain number of items over a period of time.
2) The amount of electrical power consumed by the system during operation.
3) The ability of the system to adapt to changes in product volume or type.

V. CONCLUSION

Nowadays, in highly competitive world the industries need to be well equipped. The management of the highly integrity of supply of a production, through raw material to deliver finish product, through quality manufacturing is of paramount importance. To accelerate the process and to maintain the quality of the products, automation is required. Automatic production related process needs to be introduced. It is very necessary to bring diversity in products considering shape, size and colors, etc. By applying the idea of this project, an industry can easily sort the required product according to its height, convey them to the required destination and also count them. Though it has some limitations, by some modification this concept can be implemented in wide range of application.

VI. REFERENCES

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