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Automated Job Rejection and Rejected Part Counting System of Poor Quality Material

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Abstract : *Industries now play an important part in the national economy. As a result, maintaining the quality of the product produced by an industry is critical. The purpose of this work is to offer an automatic system for determining a product's dimensional (length) accuracy and rejecting defective products. The existence of the object is detected using an infrared sensor. When a product is delivered, the motor starts running, and the conveyor belt follows suit. The dimensions of the infrared sensor are detected. If the product's dimensions are correct, it will be transported to the acceptor bin; if not, it will be discarded. The product is rejected into the rejecter bin via a pneumatic actuator.*

Keywords -IR Sensor (Infrared Sensor), Pneumatic Actuator, Digital Kit For Rejection Job Count, DC Motor, Control Unit.

I INTRODUCTION

A conveyor system is a piece of material handling equipment that moves items from one location to another. In addition, the conveyor system can be utilised to accept and reject materials or products. Conveyors are utilised in practically every industry that requires the movement of materials. As labour costs rise and client demand rises, automated conveyor systems have proven to be extremely effective. This article is based on a completely automated material handling system project. The following are some of the benefits of using automated conveyor systems:

1) Manpower savings.
2) Quality and efficiency improvements
3) Increase consistency and adaptability.

Material handling by hand may cause product damage; also, the person handling the material will not be able to recognise the flaw in the product quickly by looking at it with his or her naked eyes. This procedure takes a long time. There is also the need for skilled workers. As a result, a completely automated material handling system is designed, taking these issues into account. The product is moved by a conveyor belt in the material handling system [1]. Design parameters such as belt speed, belt length, pulley design, and motor selection are all done [2]. The presence of the product is detected using an infrared sensor, which permits the conveyor belt to be started. [3].The method employs infrared sensors attached to the base frame, which detect the product's size and movement and transmit the data to the microcontroller unit. The signal from the IR Sensor is received by a microcontroller, which then sends the signal to the pneumatic actuator [4]. This is accomplished utilising infrared sensors and a microprocessor unit. The speed of the belt and the speed of the actuator are synchronised. In

addition, the micro controller instructs the actuator whether to plunge the product into the rejecter bin or allow it to pass through to the accepter bin. When compared to human handling and inspection, automation saves time and enhances material handling speed.

II WORKING

The major goal of this article is to check the product's dimensional accuracy. As a result, the system's operation is entirely dependent on the product's size. To do so, an IR sensor is initially employed to detect the object's presence. The motor starts working when the product is retained on the conveyor. The conveyor belt is driven by the motor, which is attached to the driving pulley. The product goes forward on the conveyor belt due to the motion of the belt. The IR sensor is situated between the routes of the conveyor belt near the driving pulley, as shown in fig.1.1. When a product comes into touch with an IR sensor, the sensor measures the product's dimensions. The dimension here refers to the product's vertical height. The microcontroller receives a signal from it. The product's measured measurement is then compared to the specified dimension by the microcontroller. If the dimensions match, the product is allowed to travel through the acceptor bin at the end of the conveyor belt. The microcontroller sends a signal to the pneumatic actuator if the product does not fit the specified dimension. The product in the rejecterbin is plunged off by a pneumatic actuator.

Block Digram

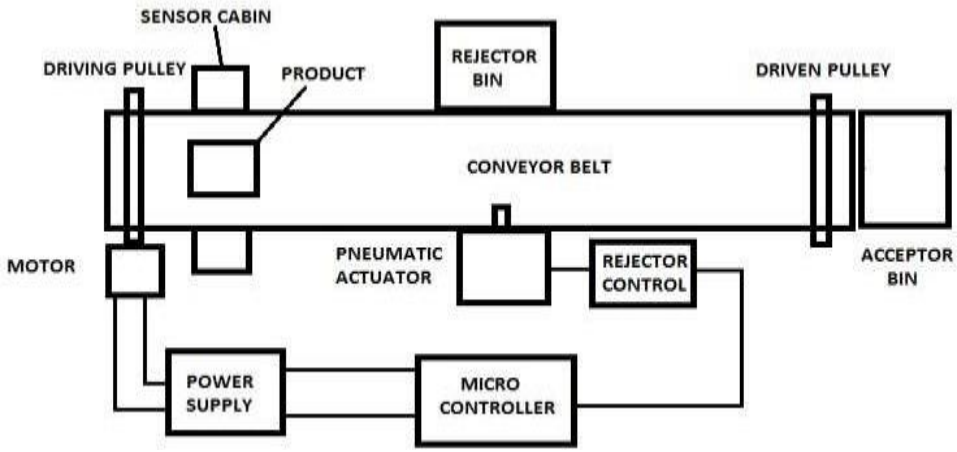


Fig.1.1 Architecture Diagram Of Whole Project

Objectives

1]Our study paper's goal is to improve industry quality and capacity.

2] Manual duties and operations are no longer necessary.

3] Lower the product's cost and processing time.

III DESCRIPTION OF SYSTEM COMPONENTS

IR Sensor

An infrared sensor is an electronic equipment that detects and/or emits infrared radiation to sense particular features of its surroundings. A transmitter and a receiver make up an IR sensor. The infrared rays are transmitted by the transmitter and received by the receiver.

If there is material on the conveyor, the IR sensor detects it and only provides the signal to start the conveyor system. The IR sensor is also used to measure the object's vertical dimension. The IR sensor is positioned at the desired material height. Below which IR rays can flow through without being reflected. If the material size exceeds the pre-determined size, the rays are reflected back to the receiver, which sends a signal to the microcontroller for further material rejection through actuation. Microcontroller

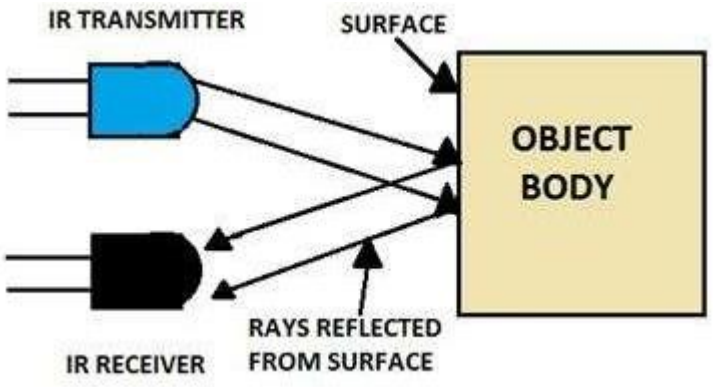
The role of the microcontroller is to accept signals from the IR sensor and pass them on to the actuator. The object and actuator speeds are synchronised, and this synchronisation is accomplished utilising belt speed. In the actuation of pneumatic actuators, the microcontroller plays a critical role. With the help of the UVision KEIL4 software, the microcontroller is able to function in this manner. The 8051 microcontroller is utilised in this paper..

DC Motor

We use a DC Mabuchi motor JC-578VA for belt transmission. The following is the motor's specification:

Model Number: JC-578VA Brand Name: MABUCHI Servo type 100 revolutions per minute (RPM)

Fig. IR Sensor



3. 1 Conveyor Belt

The conveyor belt used here consists of two pulleys with continuous chain of product one of the wheels is powered by a 14 rpm converted speed, moving the belt and the material on the belt goes forward.

The length of the belt is given by:

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Where:

D→ Diameter of the larger pulleyd→ Diameter of the small pulley

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$L = 2C +$

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$$\pi$$
$$(D + d) +$$ $$-$$
$$2$$

$$(D-d)2$$

$$4\times C$$

C→ Central distance between two pulleys

The central distance between two pulleys is 520mm.

$$L = 2C + \frac{\pi}{2}(D+d) + \frac{(D-d)^2}{4\times C}$$

=2*520+1.57*(45+45)+0

L=1182mm =1.182 meters

Specifications of belt are:Type of belt = Flat Belt Material used = Nylon Length = 1.182 m
Width = 0.125 m

3.2 Pneumatic Actuator

Pneumatic actuator used here is Pneumax ISO-6432MIR Cylinders, Double acting, Magnetic, With stainless piston rod.

Specifications of Pneumatic actuator are:

Type = Double acting pneumatic cylinder.

Bore Size = 8 MM

Stroke = 15 MM.

ISO Profile = ISO 6432.

Operating Temperature Range = 10-40ºC.

Working Medium = Compressed air upto 4 bar pressure.

Force of piston required to push the rejected object=

$$F = P * \pi * (D^2 - D^2)$$

$$4 \quad 1 \quad 2$$

Where:

F= Force required by piston(N)

P= Pressure

D_1= Bore diameter of Piston in (m)D_2

= Piston rod diameter (m)

$$= (10)^5 * \frac{\pi}{4} * [(0.015)^2 - (0.008)^2]$$

=12.66N

=0.012KN

IV. CONCLUSION

Because of its operating principle and wide application, the created model of automatic material sorting is good. An industry can readily sort the required product according to demand by using the concept of this model. Thus, manual chores and operations are decreased since it does not require labour for product sorting; the object sorting process is faster than manual sorting, cutting handling and inspection time to a minimum, lowering human costs and time. There are several limits, but due to the system's versatility, certain modifications may be made to alleviate these limitations, and this concept can be used to a variety of material handling applications. This approach is applicable to the packaging business., Quality control for industrial application, such as checking product dimensions in production lines. Because the structure is adaptable, various sensors to detect various problems could be utilised in the future.

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