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AUTOMATIC DIMENSIONAL ACCURACY ASSERTION ON CONVEYOR BELT AND REJECTION OF DEFECTIVE PRODUCT

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Abstract- *The goal of this paper is to propose an automatic system to assert the dimensional (length) accuracy of a product and the rejection of the defective products. 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. A Laser is used which cut the product and a counter start to count. The time is calculated and is compared with the time which was set earlier knowing that how much time a defect less product will be in contact with the laser. From this, a decision comes whether the length of the product is right or wrong.*

Keywords: Dimensional accuracy, Automation, Motor, Micro Controller, IR Sensor and Conveyer belt.

1. 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 the 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

2. AUTOMATION

Automation is the use of control systems such as numerical control, programmable logic and other industrial control systems, in concern with another application of information technologies such as computer aided technologies CAD, CAM, to control industry or industrial machineries and industrial process or processes, reducing the need for human intervention.[03]

2.1 Automation Tools

Engineers now can have numerical control over automated devices. Computer-aided technologies (or CAx) now serves the basis for mathematical and organizational tools used to create complex systems. Notable examples of CAx include Computer-aided design (CAD software) and Computer-aided manufacturing (CAM software).The improved design, analysis, and manufacture of products enabled by CAx have been beneficial for the industry.[04] Together information and technology with industrial machinery and processes can assist in the design, implementation and monitoring of the control system. One example of an industrial control system is a programmable logic controller (PLC).PLC is specialized hardened computers which are frequently used to synchronize the flow of inputs from (physical) sensors and events with the flow of outputs to actuators and events. Human-machine interfaces (HMI) or computer human interfaces (CHI), formerly known as man-machine interfaces, are usually employed to communicate with PLCs and other computers. In industrial process and manufacturing environments, they are called operators or something similar. In boiler houses and central utilities departments they are called stationary engineers.[06]

Different types of automation tools exist:

- ANN - Artificial neural network
- DCS - Distributed Control System
- SCADA - Supervisory Control and Data Acquisition
- PLC - Programmable Logic Controller etc.

2.2 Advantages of Automation Compared to Manual

- It is used to avoid human errors.
- By using automation it reduces the testing Lifecycle with respective to time.
- We get more reliable test result.
- It reduces man power.

3. 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.

3.1 Block Diagram of the Working Principle

A block diagram of the working principle has been shown in Figure 1. From this diagram it is clear that when a product is reached to the detection zone its length is measured with the help of the IR sensor. If the length of the product is accurate it is shown in the LCD display and the product is passed to the product box by the movement of the conveyor belt and if the length is wrong then it is dumped into the waste box by means of a punching motor.

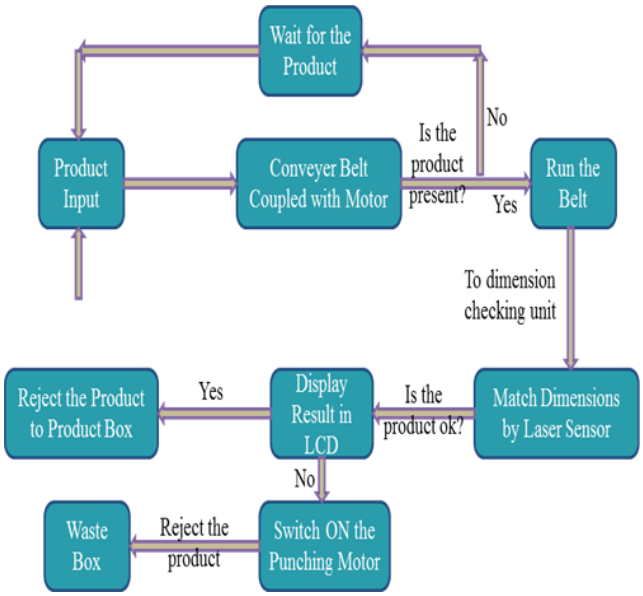

Figure 1: Block diagram of working principle.

4. DETAILS OF THE DESIGNED MODEL

The detail of the model is presented below step by step:

4.1. CAD Model of the Designed System

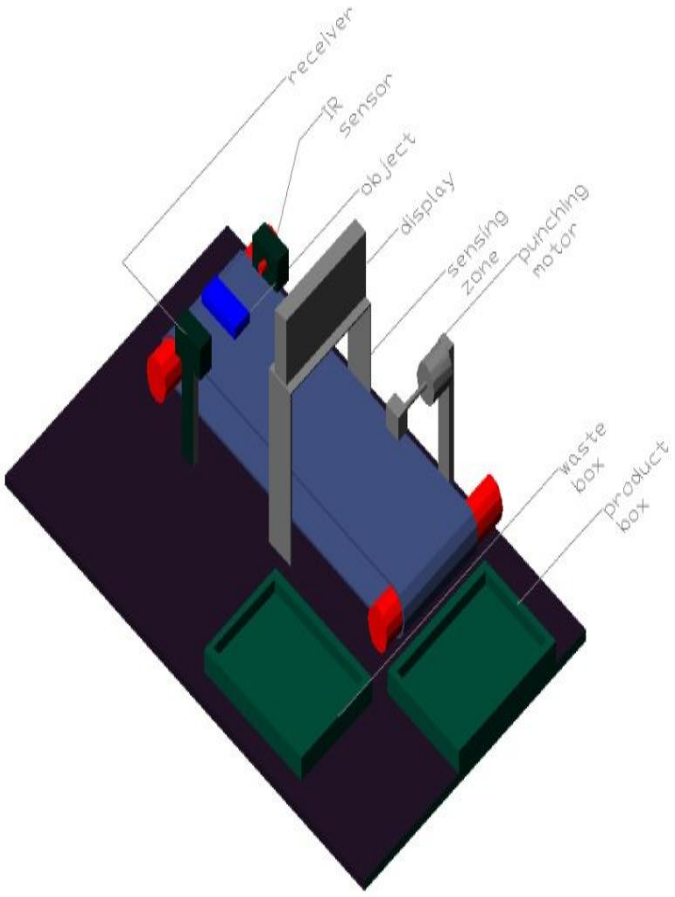

Figure 2: CAD Model of the system

A three dimensional CAD model, showing different mechanical component of the designed model in Figure2.

4.2 Circuit Diagram of the Designed Model

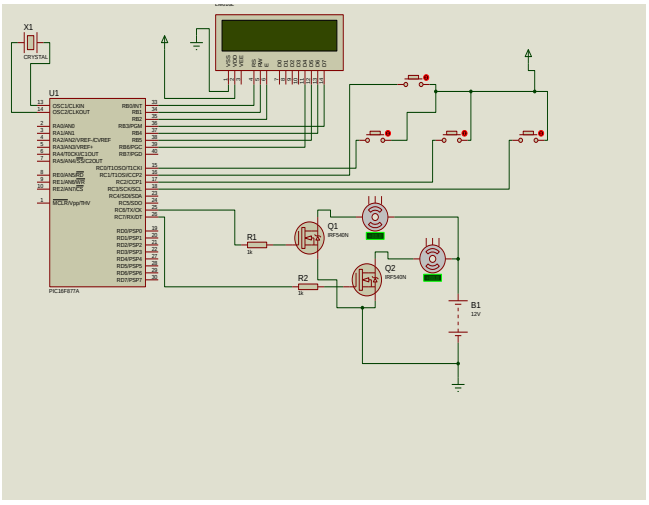

Figure 3: Circuit Diagram

The connection diagram of the control system of the proposed model is shown above in Figure 3. A PIC -16F877A microprocessor is used to control the system. The LCD display shows the status of the product. IR sensor is used for the detection purpose and two stepper motors are used as actuators. For the ease of operation some switching devices are also used.

4.3 Programming Language

To program the microprocessor C and C++ platform is used.

5. RESULT AND DISCUSSION

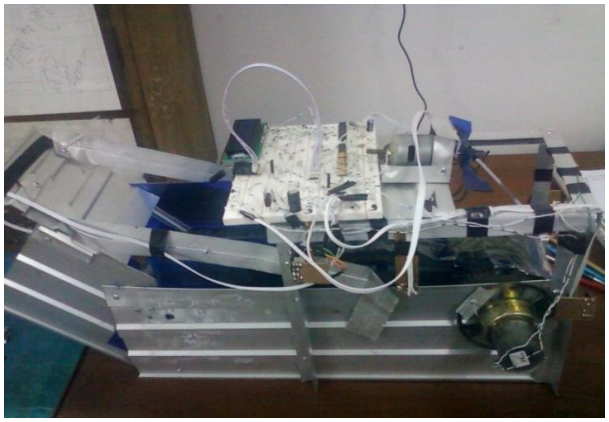

Figure 4: The camera view of the dimensional accuracy accretion system.

The dimensional accuracy assertion system can measure the length of the product accurately and based on this measurement can also take the decision whether to pass a product into the product box or dump it to the waste box. The counting of objects also accomplished by the system. It can only measure the length of the product. If more sensors are used then it will be possible to measure more dimensions such as height and width. For actual industrial application Limit switches can be used in replace of sensors and pressure coil or pneumatic system can be used to remove the rejected product from the conveyor belt.The response time of electromechanical system is relatively fast. But it can be made faster by using industrial grade motor. The microcontroller and motor used in presently developed dimensional accuracy assertion system are properly synchronized. When the industrial grade motor will be used, then the system should be synchronized to perform smoothly and in a faster way. Steps can be taken to mesh the teeth of the pinion and the timing belt perfectly to avoid the slipping of conveyor belt and get more precise performance.

7. CONCLUSION

In today's highly competitive global world, the management of the integrity of the supply of a product from raw material to delivered finished product, through quality manufacturing is of paramount importance. For the declaration of a product bearing high quality, dimensional accuracy assertion is a must. So our developed model of automatic length shorter is an excellent one because of its working principle and wide implementation. By applying the idea of this model an industry can easily sort the required product according to its demand. Due to its simple mechanical design and use of available sensors in the market it will be cheaper. If a large scale production of the dimensional accuracy assertion system is possible then the price of this product will be cheaper than the present manufacturing cost. For more precise and accurate assertion of dimensional accuracy a more accurate structure could be designed. Though it has some limitations, but by having done some modification this concept can be implemented in a wide range of application.

8. ACKOWLEDGEMENT

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