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Embedded System Based Smart Conveyer Belt Security System for Textile and Dyeing Industries

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Abstract - In the textile dyeing industry, there exists a problem in the conveyor belt movement system, that if the cloth comes out of the conveyor belt it may cause some damages to the fabrics. It results in a great loss to the industrialists. In previous days they used Infra Red sensor to sense whether the cloth comes out of the conveyor belt or not. If the cloth comes out of the conveyor belt system, they switched off the system and adjust the cloth manually. It consumes more production time and also causes damage when adjusted manually, whether it may be torn or it becomes dirty. In order to overcome this, an automation system was proposed in a way to reduce the production time, so the products will be delivered to the client in time and also it reduces the damage caused while adjusting the clothes. In the proposed system, a photo sensor is used to identify whether the cloth comes out of the conveyor belt system or not. If the cloth comes out, then the sensor output will be sent to the controller in order to switch off the system. There are two indicators provided on the outside of the system. If the cloth comes out of the conveyor belt in the right direction, red led will glow and the buzzer will produce a sound, similarly if cloth comes out of the conveyor belt in the left side, green led will glow and the buzzer will produce a sound and also the conveyor belt system is switched off immediately by controlling the motor. After adjusting the cloth, the conveyor belt system will be automatically turned on.

Keywords— Textile dyeing, Conveyor, Infra Red sensor, Photo Sensor, Automation

I. INTRODUCTION

Human beings have invented new technology in order to satisfy their needs since their existence. The main purpose of innovation in technology is to simplify the life of human beings on the earth in making every day's work easier and faster. In India one third of the population rely on industrial activities. Mainly people in northern India had more concern in their dressing sense, so they want a quality product. There are so many process involved in creating the good quality cloth namely, dyeing, weaving, spinning, etc. In the textile dyeing industry there exists a problem, that if the cloth comes out of the conveyor belt, it may cause some damages to the fabrics and also it increases the production time. The proposed system must reduce the manual work and also it must decreases the production time[1]. The proposed system consists of a photo sensor in order to send the signal to the controller, when there is a deviation of cloth from the conveyor belt or if the cloth comes out of the conveyor belt, the system will be automatically switched off and the cloth will be realigned properly, then the system will be automatically turned on. There will be a led, and the buzzer, which is used to indicate the status of the system. If the cloth gets sensed by the photo sensor, which send the signal to the PIC 16F877A controller and also there will be a led blinking outside the system connected with the controller[2,5]. The purpose of the indicator is to display the direction where the cloth comes out of the conveyor belt; it may be left or right.

II. EXISTING SYSTEM

In earlier days, when the cloth comes out of the conveyor belt, they used to switch off the system and align the cloth manually and then turn on the system. The limitation in this type of systems is that it takes more production time and also it causes some damage to the fabrics. There is no perfection in the fabrics production, and also it requires additional manual work to complete the product, so it produces great loss to the industrialists. They fail to produce the product to the client on correct time, so it creates a situation to lose the faith on the company. Regain of old clients are more difficult than addition of new clients. This problem was encountered by using IR sensor to identify whether the cloth has comes out of interruption that crosses the sensing area of the IR sensor, it sends the signal to the controller and it will switch off the system. Because of this, it creates confusion to the employees working in the industry[3], it causes delay to produce the product. This problem was overcome by introducing a photo sensor which has a high sensitivity to detect the cloth that comes out of the conveyor belt or not. When the cloth comes out of the conveyor belt, the IR sensor senses it and sends the signal to the controller, then the system to be switched off and then they adjust the cloth aligned in an unordered manner. Even though it reduces the production time, it is not so efficient because the sensitivity of IR sensor is very low.

2.1 Conveyor Belt

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 it is also called as drums, with an endless loop of carrying medium the conveyor belt that rotates about them. One or both of the pulleys are powered, moving the

belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. 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 transport large volumes of resources and agricultural materials, such as grain, salt, ore , coal, sand, overburden and more. The belt consists of one or more layers of material[4]. Many belts in general material handling have two layers. An under layer of material to provide linear strength and shape called a carcass and an over layer called the cover. The carcass is often a woven fabric having a warp & weft. The most common carcass materials are polyester, nylon and cotton. The cover is often various rubber or plastic compounds specified 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 essential.

Figure: 1.1 Conveyor belt

III. PROPOSED SYSTEM

The main objective of our project is to protect the fabrics which would get damaged while comes out of the conveyor belt system in the textile dyeing industry. In the existing system, if the cloth comes out of the conveyor belt the system needs to be switched off and then the cloth should be adjusted manually and also it increases the production time. So in order to reduce the production time an automation system was proposed in a way to protect the fabrics by sensing the position of conveyor belt using photo sensor which sense whether the cloth comes out of the conveyor belt or not. If it comes out, the photo sensor senses it and sends the signal to the controller which automatically switches off the system and then aligns the cloth in a proper manner [5]. After aligned the cloth in a proper manner, the system needs to be switch on automatically. There will be an Indicator, led and the buzzer which shows the status of a conveyor belt system. When the cloth sticks to the right side of the conveyor belt, the sensor senses it and sends the signal to the controller which automatically switches off the system and then the led will be glow which depicts that there is some problem and also the buzzer will be turned on. This helps others to identify the defect easily, so they can come and align the cloth in a proper manner and then the system switched on automatically.

3.1 Block Diagram

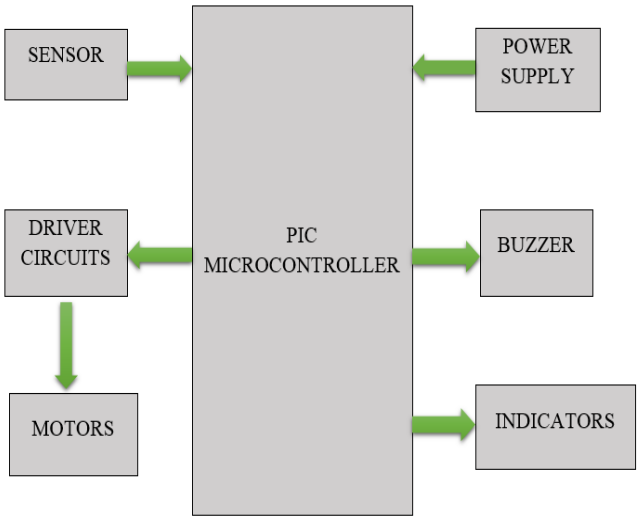

Figure3.1 Block diagram of proposed system

3.1.1 BUP Sensor

In this module we have used a pair of BUP sensor on both the sides of the conveyor belt which is fitted to a stand. When the cloth which rolls over the conveyor belt and when it cuts light from the transmitter part of BUP sensor ,then the sensor sends low pulse signal to controller.

3.1.2 Indicator and Buzzer

When the cloth cuts the right sensor, it sends low pulse signal to the controller which turns on the right indicator. Similarly when the cloth cuts the left sensor, it sends low pulse to the controller which turns on the left

indicator. When then indicators are turned on a buzzer which produces a beep sound is also indicates that the cloth is out of its path. Here both Buzzer and Led is used as the indicators here.

3.1.3 Driver circuit

Controller is operated at 3-5v, 1 Amps and DC motor which is interfaced using controller is operated at 230v, 5-10 Amps. So we are driver circuit .It is used to isolate controller and motor.

3.1.4 Power Supply

Power supply is 230v, 1Amps which is regulated and rectified using transformer and diode stepped down to 5v and 12v supply.

IV. SIMULATION OUTPUT

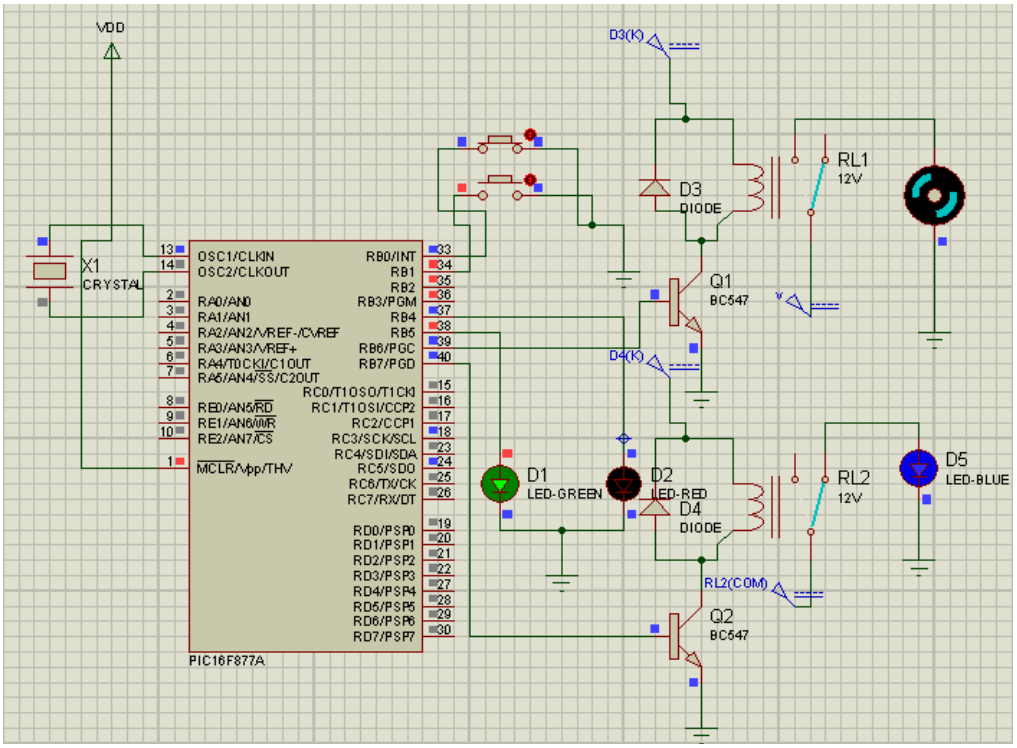

Figure 4.1 Indicating right side

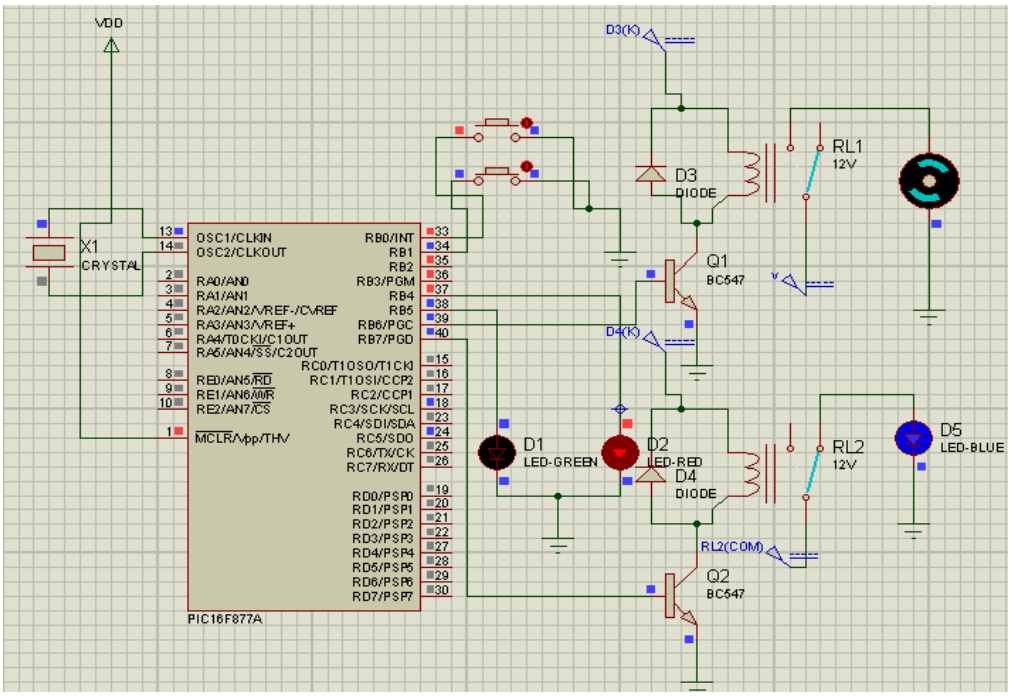

Figure 4.2 Indicating left side

4.1 Hardware Set-up

- The hardware model of our proposed system that is equipped with BUP sensor and other controller components.

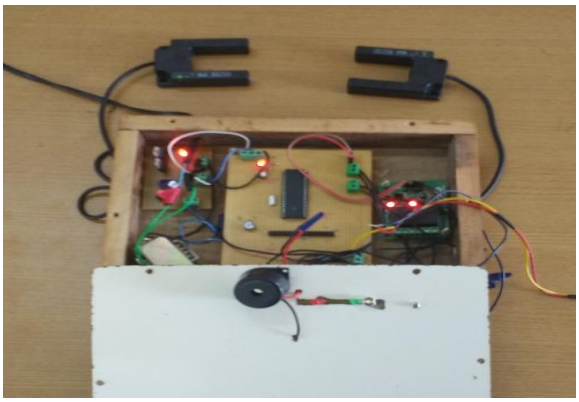

Figure 4.3 Construction of sensors with the system

- It gives the details that whenever a cloth comes out of the conveyor belt, the sensor sense it and send the signal to the controller as shown in figure 4.3.
- The direction in which the cloth comes out of the conveyor belt is indicated with the help of led, if the cloth comes out of the conveyor belt in right direction, red led will be glow as shown the figure 4.4(a).

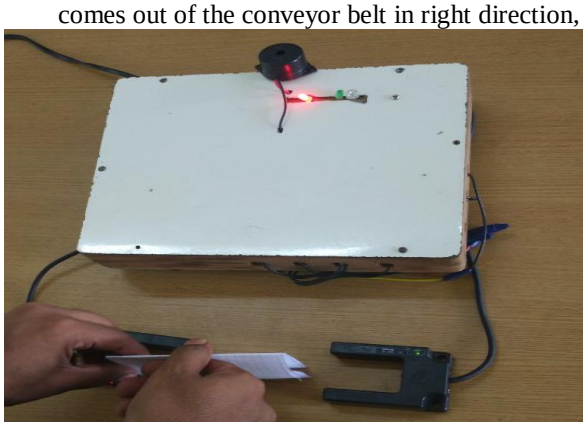

Figure 4.4 (a) Indication through LED (For right side)

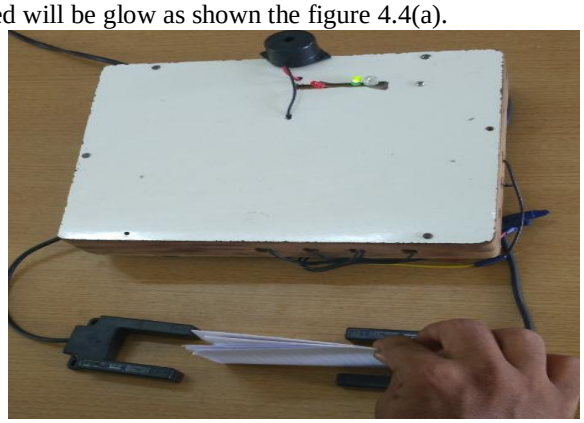

Figure 4.4 (b) Indication through LED (For left side)

- If the cloth comes out of the conveyor belt, in the left direction green led will be glow.
- The Output of our proposed system is that whenever the sensor sends the signal to the controller the system needs to be switched off is shown in the figure 4.4(b)

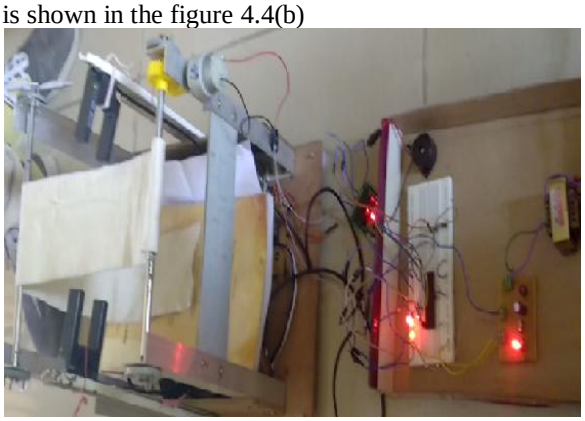

Figure 4.5 Output of the proposed system with belt arrangement

- If the cloth comes out of the conveyor belt, the system automatically switched off and the cloth was adjusted manually, and the system is automatically turned on.

V. CONCLUSION

The proposed work with photo sensor is more efficient than previous existing system. In existing system there are no proper safety measures, but in the proposed method safety measures are provided, such as provision of photo sensor which is a water resistant one and its coverage range is 30mm, so it can easily detect the cloth, when it comes out of the conveyor belt. The proposed model reduces the manual work and it creates an alert to the employees through buzzer whenever the cloth comes out of the system. When the system is switched off, the belt is manually without causing any damage to the fabrics, so there is no possibility of time delay in production time. The proposed model of the project is semiautomatic one, because after the system is switched off, the clothe will be manually adjusted without

causing any damages to the fabrics. In future it may be implemented automatically, that is when the cloth comes out of the conveyor belt system, no need to switch off the system, instead the belt is automatically adjusted by turning the entire conveyor belt system up and down or right and left as per the requirement of the movement in the system with the help of embedded programming. If it is employed, there is no need of manual work and there is no delay in the production time. This model can be used in any industries in order to sense the interrupt and activate another device to avoid the damage to the production materials in industries.

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