

# DESIGN AND DEVELOPMENT OF FAULTY PRODUCT DETECTION AND SEPARATION FOR MEASURING ACCURATE WEIGHT OF SOAP

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## Abstract:

*Wireless Sensor Networks have become a new information collection and monitoring solution for variety of products such as soap. All product manufacturing units need to have a faulty product detection and separation system in order to maintain good product accuracy by using conveyor belt system. This proposed system detects faulty product according to required weight by using load cell and proximity sensor, thus with the help of DC motor with separator arm faulty products are separated according to the weight. This system is powered by a DC Geared motor, and the system consist components like Rollers (nylon) and silicon conveyor belt are used to develop a conveyor belt system.*

*This paper deals with design and development of faulty product detection and separation system.*

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**Keywords:** Conveyor systems, Microcontroller, Load cell, Fault detection.

## 1. INTRODUCTION

The accurate weight of soap is an important aspect for soap manufacturing industry. Industries need to have high class equipment and skilled worker, but this will increase the cost of product and that can lead loss of the company or manufacturing industry to overcome this problem, quality department is set in all industry for checking the weight of product.

In this proposed system, packed products like soap moves on a conveyor belt mechanism, where we are using sensor and load cell, sensor used for detection of product and load cell is programmed in a such a manner that the product with required weight (i.e. 70 grams), such product is only allowed for further packaging and the product which does not satisfy the required weight will be rejected automatically by means of separator arm with motor. Here we use rollers and silicon belt to develop a conveyor belt system and it is rotated by DC geared motor.

## 2. LITERATURE SURVEY

This paper deals with advance industrial technology and automation in manufacturing world. Industries are adopting more aspects of automation to increase product accuracy and cost. This proposed system uses automated conveyor system by detecting the size of the material using ultrasonic sensor [1]

According to this paper is concluding with automation process for best performance of industrial process. Image processing has led to a great role in the applications of robotics and embedded systems. Sorting of objects are usually done by humans which takes a lot of time and effort. Detection of object is achieved using image processing technique and suitable sensor and hence robotic arm can be used to sort various objects [2]

The new method for giving idea with automatic sorting machine by using conveyor belt for manufacturing industry in many fields. This is an industrial automation based application. It shows the concept of normal conveyor belt, but with some intelligence. It has the ability to sort the object of different sizes. The FPGA is used in PLC and controls the relay and drives relay according to output of photo interrupter [3]

This paper says with importance of automation process for the growth of industry For precise output and accuracy this proposed system use robots with sophisticated sensors This paper present colour based object sorting system which uses the machine vision and the operations of image processing [4]

This method deals with Sorting of products in an industry which is generally carried out manually. Continuous manual sorting creates quality consistency issues. Segregation based on different characteristics like weight, colour. It requires different equipment for weighing and then separating. This system proposed an efficient method which uses load cell, inductive sensor and TCS 230 colour sensor for identifying and segregating on the basis of weight, colour and type (metal or non-metal) of object and Siemens 300 Series PLC to control the overall process of sorting two types of objects [5]

This concludes idea with automated conveyor system works by detecting the size of the material in the conveyor using proximity sensors. The microcontroller analyses the data from the proximity sensor and then directs the pneumatic cylinder material to different directions, depending on the height of the material [6]

This is getting with microcontroller and sensors to automatically sort out organic and inorganic waste materials to be recycled. This helps to reduce the time taken to sort out organic and inorganic waste materials manually and to save cost involved in processing waste. This proposed system further described a sophisticated technique in sorting the waste based on the microcontroller unit that use gas sensors to separate the organic and raw wastes. The gas detection system was incorporated within the conveyer that passed in front of the gas sensor and sent data to controller through analogy to digital convertor [7]

A paper review on Improved Automated Conveyor with Auto Separated System for Oil Packaging Industry.

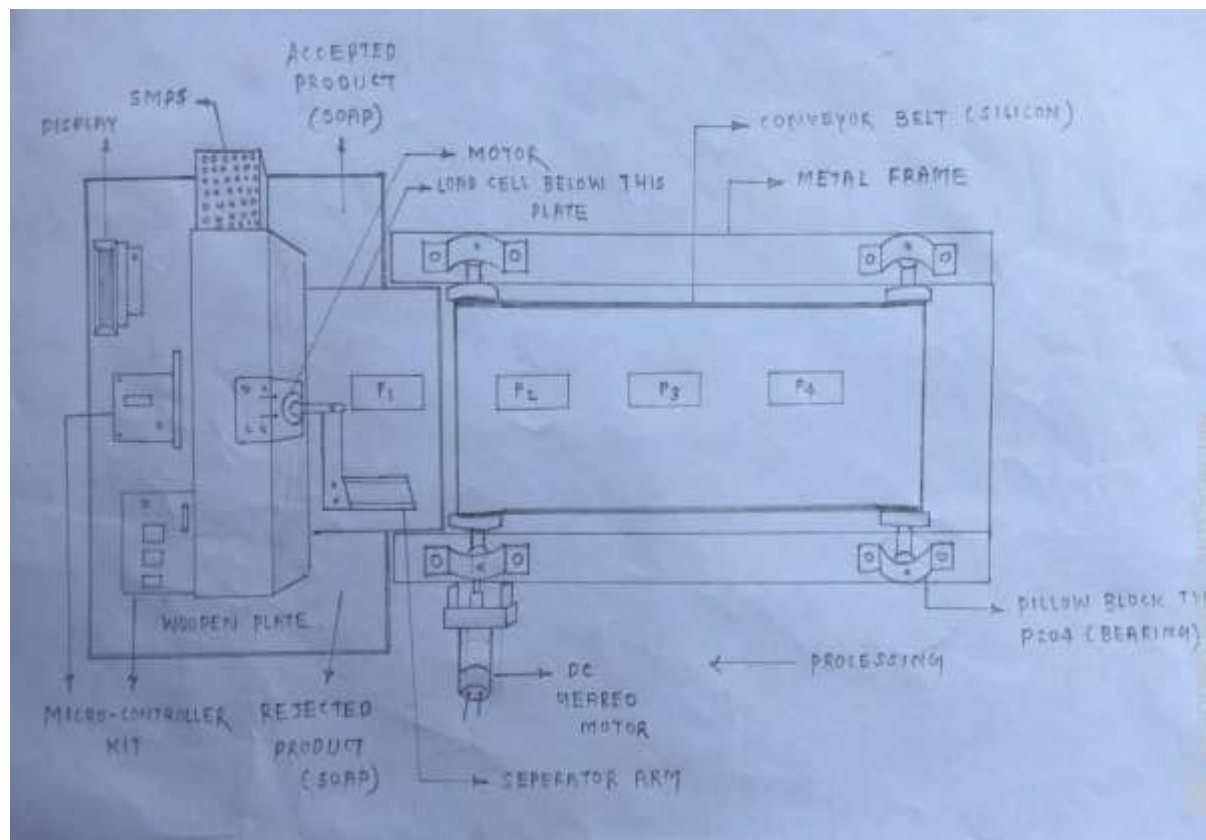
It gets with sorting of the defective oil cans on the basis of their weight because of improved quality of products, improved production rate, reduce cost of production. Today high speed of the operation and accurate weighing of packages during crossing a conveyor belt has been getting more important in the food and distribution industries. Automation is the use of control system like a computer or robot for handling different process and machinery to replace a human being and provide a mechanical assistant [8]

A paper review on Automatic conveyor or System within Process Sorting Mechanism using PLC and HMI System.

This paper concludes with Programmable logic controllers it is widely used in many manufacturing process like machinery packaging material handling automatic assembly. These are special type of microprocessor based controller used for any application that needs any kind of electrical controller including lighting controller and HVAC control system. Automatic conveyor system is a computerized control method of controlling and managing the sorting mechanism at the same time maintaining the efficiency of the industry & quality of the products [9]

This machine deals with automation conveyor system by sorting of object according to size of the material This proposed system uses ultrasonic sensor by detecting the size of the material The microcontroller analyses this data from the ultrasonic sensor and then directs the pneumatic cylinder to separate depending on the height of the material [10]

### 3. WORKING OF FAULTY PRODUCT DETECTION & SEPARATION SYSTEM



The system consists of conveyor belt mechanism on which the product (SOAP) will be kept for detection and separation purpose.

Main objective of this machine is to detect the faulty product and separate according to the accurate weight of the product.

When the machine gets operate, first start the SMPS switch for rotating the motor (DC geared type) and conveyor belt gets rotate, products (SOAP) are kept on conveyor belt for measuring the accurate weight through load cell and when the SOAP goes on load cell plate then load cell senses the weight of product to accept and below the required weight of product will be automatically rejected by separator which signal is taken from Relay Circuit (module) which gets the current from microcontroller and microcontroller is programmed manner as computerized but microcontroller gets the current from switch mode power supply (SMPS) and LCD display works as a showing the digitally form of acceptance and rejection for the product(SOAP). This machine works in various packaging industry for automation of measuring the accurate weight of product.



#### 4. COMPONENTS

**Conveyor belt** - In conveyor belt mechanism a moving belt that carries objects from one place to another place, it is used in factory for processing. Conveyor is a carrying medium of a belt conveyor system. And on this conveyor belt product moves on it.



**Bearing (UCP 204)** - This type of bearing is most widely used in transmission mechanism for rotates the roller with a freely rotates and roller is inserted inner side of the bearing for taking the rotation of conveyor belt.



**Roller (nylon)** - Nylon type rollers are applicable to the many and varied functions where roller systems are the perfect solution for giving rotation to the conveyor belt. Nylon roller has higher wear resistance than other material this means the roller is last longer.



**DC geared motor** -The DC geared motor has direct current motor it's a rotating electrical device that converts direct current of electrical energy into mechanical energy. A DC geared motor is an all-in-one combination of an electrical motor and gear box, this makes it is simple for high torque low speed application because it combines motor with a gear reducer system. This helps to reduce the motor's shaft speed and it increases the torque output of the motor.



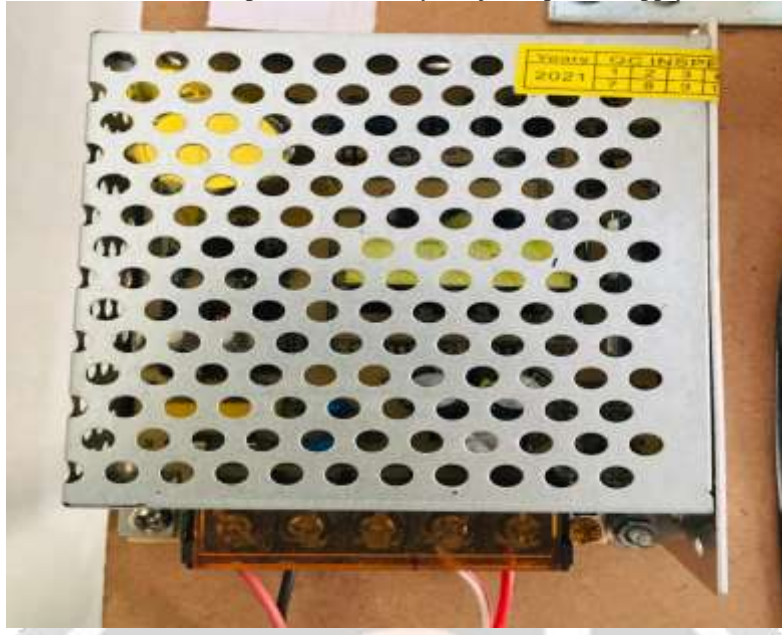


**Load cell (strain gauge type)** - The system has strain gauge type load cell usually features in a wheat stone bridge configuration. The force being measures deforms the strain gauge this type of load cell and the deformation is measured as change in electrical signal. A load cell measures the mechanical force mainly the weight of an object. They are widely used because of the accuracy with which they can measure the weight. By using load cell designed load cell is programmed in such a manner the product which lies in the acceptable range that product is only allowed to pass the product with accurate weight, the products which are below the desirable ranges are rejected automatically by means of separator arm.



**Switch mode power supply (SMPS)** - The switch mode power supply is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. It makes use a switching regulator to

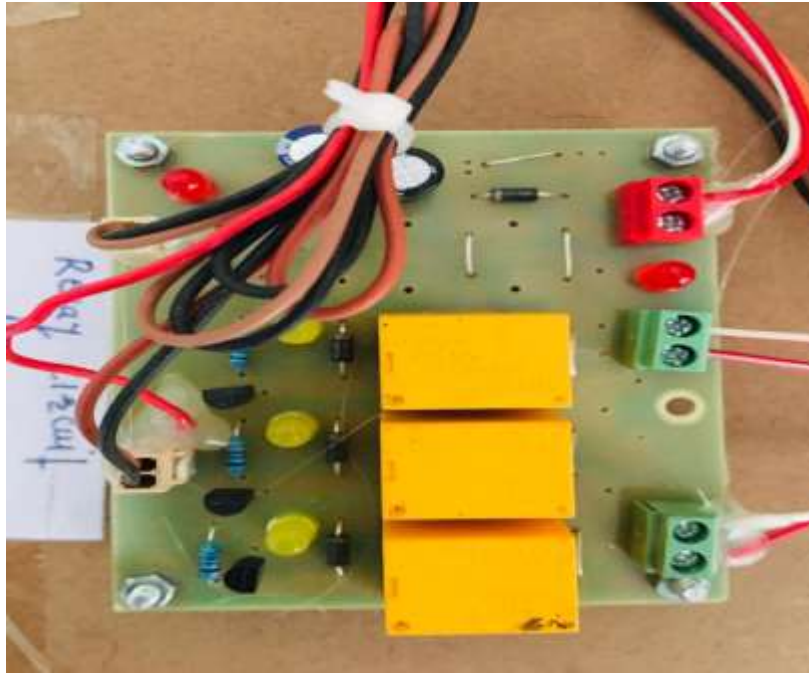
transfer electrical power effectively. Its just a power supply unit.



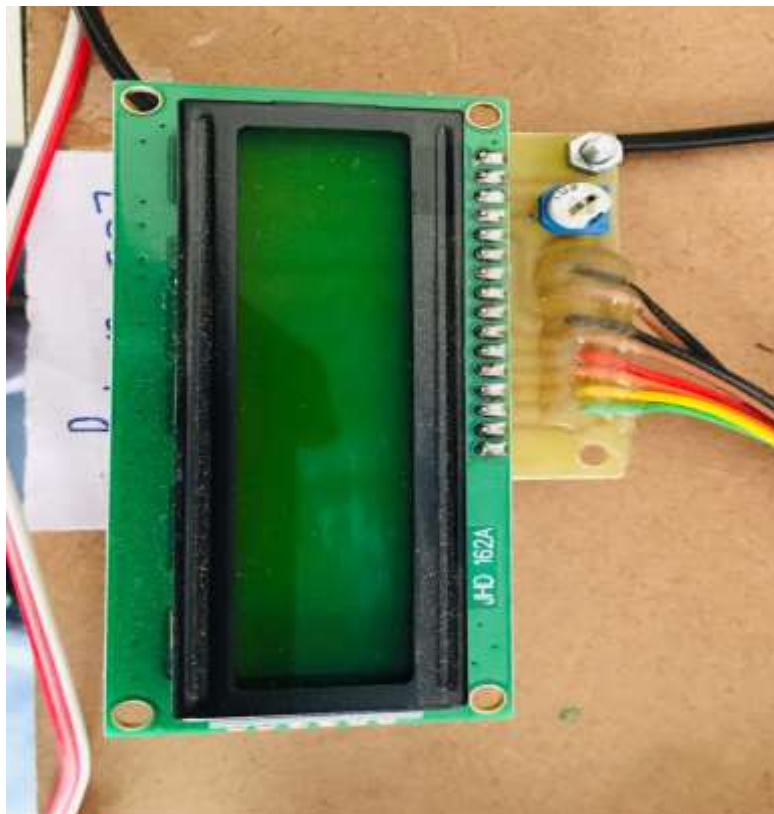
**Microcontroller (Arduino)** - The FPD&SS has a microcontroller as a component used for controlling the mechanism, microcontroller contains programmed to operate the mechanism by programmed. Microcontroller is a compressed micro computer manufactured to control the functions for the fault detection and separation system for product weight measurement.



**Relay module** - The system has a power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low power signal from a microcontroller when activated. Relays control one electrical circuit by opening and closing contact in another circuit.



**LCD display** - The liquid crystal display works by using liquid crystal to produce an image. The liquid crystals are embedded into the display screen and there is some form of backlight used to illuminate them, but this system has LCD display to show the digital form of accepted and rejected product.



## 5. CONCLUSION

The automatic material separating conveyor system has been constructed and tested. The automatic material separating system is highly useful in quality control system to reject and accept material/product. This automatic material separating conveyor system will help to separate material accurately with a required weight. The



automatic separating conveyor system will be cost, time and space saving thus aiding to be beneficial in both the economic and technical aspects. Overall inspection time and enterprise overhead expense is greatly reduced. It aids in speeding up the process as well as improving efficiency of production line. In proposed system to check the every soap's weight and it decides the product (soap) is accepted or rejected. The decision to accepted or rejected a manufactured part based on automatically inspection is extremely important to a production operation. Inspection movements are necessary to increase the accuracy of product weight and improve the performance of inspection processes.

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