

Automatic Weighing and Packaging Machine for Small Scale Industries and Grocery Stores

Kush Midha¹, Omkar Singh Kushwaha², Dr. D. Gnana Jeba Das³

¹U.G. Student, Electronics and Communication Engineering, Galgotias University, Greater Noida, UP, India.

²U.G. Student, Electronics and Communication Engineering, Galgotias University, Greater Noida, UP, India.

³Professor, Department of Electronics and Communication Engineering, Galgotias University, Greater Noida, UP, India.

Abstract - Technology is developing day by day but still many of the small scale industries and grocery stores is lagging behind technology and still weighing and packing the products manually. Mostly small scale food industries and grocery stores complete the whole process which includes weighing, packaging, sealing and printing the price on the product by themselves or give those product to get sealed and printing the price to other stores which cost more to them. Although this process is quite time and effort consuming which a great impact on their businesses.

This paper presents the development of a machine that automatically weighs and packs the product without any external help. The main purpose of this machine would be reducing time and efforts by humans to weigh and pack the products automatically. The machine will be operated using microcontrollers and sensors.

Key Words: Automatic weighing, Automatic packaging, Arduino UNO board, Load Cell Sensor, Hard Plastic Container.

1. INTRODUCTION

In current time automation is present in each and every field out how heavy (someone or something) is, typically using scales industry around the globe. The concept of this is that it is a fully automated machine which performs four things at the same time i.e. weighing, packaging, sealing and printing of the price. The machine can be various small scale industries for weighing and packaging products. It can be used to weigh and pack products like grains, rice, dry fruits, sugar, tea etc. It can weigh and pack product ranging from minimum of 100 grams to the maximum weight of 10 kilograms in bags. The fills the bag and then pack the bag in the separate area after packaging it prints the price of the product according to the weight of that particular product.

Currently there is less profit margins in their field. The industries must take a look that how should they automate themselves and provide at the rate the customer is willing

to pay. The whole process of weighing, packaging and sealing is to be done with the help of the microcontrollers, sensors and motors.

The whole machine is controlled by the microcontroller which is the brain of the machine. The processes that would be executed by the machine would be:

1. Disposing certain amount of product which would be same as the input
2. Filling of the bag with the product
3. Packaging the bag filled with product
4. Sealing the bag
5. Printing the price on the bag

2. OVERVIEW

The whole process of weighing and packaging is a 4 step process. In the first step a value will be given from the keypad and the amount given will be passed from the container to the products tube. The weight calculation will be completed using a load cell sensor and there would be a sliding lid which will open when there is input and close when the weight is same as the input. In second step a vacuum tube will open the bag and all the product would be filled inside the bag. In third step the bag will be passed through the conveyer belt and will get sealed in the end. In fourth step after sealing the price would be printed on the bag. The price would be according to the weight and the product. After printing the price the bag will be sent out by the machine. The customer has to perform only a single task that is giving the input using a keypad.

3. SCOPE

This system has a wide range of applications, some of those are showing below, but it is not limited to them.

- I. Small-scale food processing industries and groceries stores.
- II. Automated weighing and packaging machine manufacturers
- III. In India farmers may use it to package their agricultural goods directly.
- IV. Pharmaceutical firms.

4. LITERATURE REVIEW

During earlier times when there was no plastic bags and anything else the humans use to pack the products in metals, leaves, shells etc. Currently these methods are getting replaced by different packaging materials like plastic bags and other materials but the weighing and packaging the product is almost same as the earlier times. In rural areas the packaging is still being done using the candles which quiet same as the earlier times.

Tawanda Mushiri, Charles Mbohwa, International Conference on Operations Excellence and Service Engineering Orlando, Florida, USA, September 10-11, 2015^[2]. There project is concerned with the filling of packages with the less amount of cereal in each package.

The concept of the project was that it consists of a hard plastic container through which the product is poured which had to be packed. Just below the hard plastic container the film is attached and that film is basically controlled using a rotation of the weight meter. The weight is done by the rotating weight meter. They are two rollers pair one below the weighing meter which forms longitudinal seals and other set of roller pair it divide completely. Then the package comes out by sliding from there.

Prajakta Hambir, Nimish Joshi, Pranav Karande, Amol Kolhe ^[1] filed on May 2019 title as 'Automatic Weighing and Packaging Machine'. This project contemplates the machine using microcontroller, sensors and motors.

Concept of the following project is as follows. The whole system will work in 3 steps. In the first step input is given using a keypad kit. When the input is received there is a rotating disc which will dispense the product from the hard plastic container to the funnel. There is a load cell sensor which measures weight. In second step the vacuum will broaden the bag which help in easing the process of filling the bag. In last step with the help of a conveyer belt the bag will move out of the machine.

The user has to perform only two tasks:-

1. Give Input value using a keypad kit
2. Collect the bag from the system

Dirk Schaefer and Wai M. Cheung, 'Smart Packaging: Opportunities and Challenges'^[3]. According to them global market for smart packaging would be increasing and by the year 2024 it is estimated to reach \$26.7 billion. The term smart packaging means packaging of food, pharmaceuticals, tea, coffee etc. with the help of embedded systems. Smart packaging is basically used to increase the shelf life, improve the quality and safety of the customer. On the basis of digitization smart packaging will offer new business opportunities and due to that fits in realm of Industry 4.0. Product analysis methods are needed to choose optimal product and also to design and optimize production systems. Indeed, most of the known methods aim to analyze a product or one product family on the

physical level. Although different product families, however, may differ largely in terms.

5. METHODOLOGY

5.1 Project Overview

The machine is categorize in four fundamental techniques- In a microcontroller device, the setup, feeding, weighing, and sealing techniques are all computerized. As seen in the figure(1) a variety of strategies are used together. The setup and feeding procedures, as well as the weighing and vertical sealing, take place together, and the top and backside seals are completed at the end.

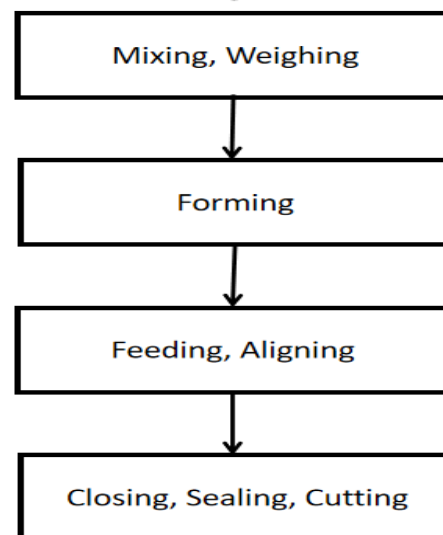


Fig-1: Working Overview

5.2 WORKING PRINCIPLE

Microcontroller and the load cell are used to operate an automated weighing and packaging device this system contains a hard plastic container which stored the materials like rice, pulses, sugar, etc., and it's also detached from the machine very easily hard plastic container is able to discharge the stuff from its bottom.

The machine contains load cell which causes the top of the plate push down words when the stuff applied over it the load cell becomes constant as a result of this the weight is directly proportional to the pressure which converts mechanical energy into the electrical energy with the help of microcontroller the input is transmitted through a dial which shows the value on LCD display. Stepper motors are used to power the container door stepper motor are used as they provide continuous torque more than a large range of speeds and provide stable speed control whether there is fluctuating loads. The plastic bags are packed with the contents of discharge from the hard plastic container these

plastic bags are kept under the system and when they are full up they are released stuff.

Electropneumatics and motors are used in the weighing and packaging machine process the hardware will be controlled by a logic controller connected to computer.

5.3 COMPONENTS

I - Hard plastic container - The term 'Hard plastic container' refers to a container that tapers downward and can discharge the substance deposited at the bottom. It is used to store the content that will be distributed. The explanation for using a 'Hard plastic container' in these devices is that the volume of material dropping from the container can be managed thanks to its tapering shape at the rim, making the operation more uniform. 'Hard plastic container' increases the amount of data collected. The walls of the hard plastic container are sealed to prevent corrosion of the products inside.

II - Load cell sensor - A load cell is a sensor that transforms an applied load, force, or weight into an electronic signal. Depending on the type of load cell and circuit used, this electrical signal may be a current transition, voltage change, or frequency shift. In load sensors, the piezo-resistivity principle is used. The resistance changes as a load, force, or tension is applied to the sensor. When an input voltage is applied, a difference in resistance induces a change in output voltage. The weighing and packing industries use strain gauge load cells the most.

III - Arduino Uno Board (Microcontroller) - A microcontroller (noun) is a miniature computer with a processor core, memory, and programmable input/output peripherals on a single integrated circuit. The Arduino Uno is an ATmega328-based microcontroller module. It features 14 optical input/output pins (six of which can be used as PWM outputs), six analogue inputs, a 16 MHz crystal oscillator, a USB link, a power jack, an ICSP header, and a reset button. Arduino uses its own IDE (Integrated Development Environment) uses as amplified version of C++, making it easier to learn to program.

IV - Stepper Motor - A brushless DC electric motor known as a stepper motor, phase motor, or walking motor divides a complete revolution into a series of equivalent phases. As long as the motor is carefully sized for the application in terms of torque and rpm, the direction of the motor may be ordered to shift and maintain at one of

these stages without any position sensor for input (an open-loop controller). DC motors that drive in discrete stages are known as stepper motors. They have a number of coils that are grouped into "phases." You can achieve very accurate positioning and/or pace modulation with computer driven stepping.

V - Keypad Kit and LCD - Both the keypad kit and LCD is used by the user. The keypad is used to give the desired input. The input can range from 100grams to 10 kilograms. When the input would be given the input given by the user will be displayed on the LCD screen.

6. RESULT AND CONCLUSION

Several experiments will be conducted to arrive at a conclusion for the machine's functional implementation. The performance of the device parameters would be assessed, and changes would be made based on the results of the tests. The first phase of testing entails ensuring the proper operation of each device separately. Since this unit will be used for measuring and packing the goods.

The whole process of weighing and packaging is a 4 step process. In the first step a value will be given from the keypad and the amount given will be passed from the container to the products tube. The weight calculation will be completed using a load cell sensor and there would be a sliding lid which will open when there is input and close when the weight is same as the input. In second step a vacuum tube will open the bag and all the product would be filled inside the bag. In third step the bag will be passed through the conveyer belt and will get sealed in the end. In fourth step after sealing the price would be printed on the bag. The price would be according to the weight and the product. After printing the price the bag will be sent out by the machine. The customer has to perform only a single task that is giving the input using a keypad.

7. FUTURE SCOPE

The system will have broad implementations in various industries. The system will be providing weighing, packaging, sealing and printing price at a minimal price and further research will lead to more advancement of the machine. The machine will be widely used in industries and stores such as food industry, beverage industry, supermarket etc.

8. REFERENCES

[1] Prajakta Hambir, Nimish Joshi, Pranav Karande, Amol Kolhe "Automatic Weighing and Packaging Machine" International Research Journal of Engineering and Technology (IRJET) Volume: 06 Issue: 05 May 2019

[2] Tawanda Mushiri, Charles Mbohwa, International Conference on Operations Excellence and Service Engineering Orlando, Florida, USA, September 10-11, 2015.

[3] Dirk Schaefer and Wai M. Cheung, 'Smart Packaging: Opportunities and Challenges',

[4] Yousef Moh. Abueejela and Abdulhameed K. Belkasem, 'Inspection, Packaging and Packing Machine Development Based PLC', Libyan International Conference on Electrical Engineering and Technologies (LICEET2018) 3 - 7 March 2018, Tripoli -Libya.

[5] Shashank Lingappa M., Vijayavithal Bongale, Sreerajendra, International Journal of Advanced Mechanical Engineering. ISSN 2250-3234 Volume 4, Number 7 (2014), pp. 803-811.

[6] Birgit Geueke*, Ksenia Groh, Jane Muncke, 'Food packaging in the circular economy: Overview of chemical safety aspects for commonly used materials', <https://doi.org/10.1016/j.jclepro.2018.05.0050959-6526>/© 2018, Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license(<http://creativecommons.org/licenses/by-ncnd/4.0/>).

[7] Agnes L. Karmausa*, Ron Osbornb, Mansi Krishanc, 'Scientific advances and challenges in safety evaluation of food packaging materials: Workshop proceedings', 0273-2300/ © 2018 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NCND license.