# Automatic Wrapping Machine

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*Abstract—In the modern day, the consumers are having various options related to food packaging. It varies from eco-friendly packaging to those designs that really assist in food preparation process. A lot of research and analysis are done to select the type of container and the packaging material used for manufacturing. Examples of packaging process include wrapping machines, labelling machines, sealing machines and many more*

*The objective of this paper is to design an Automatic Wrapping Machine using a PIC18F45X Micro-controller. The main advantage of a wrapping machine is that it increases the efficiency of the packaging process thereby reducing the cost of labour.*

*Here, the machine has 2 sections. One section is the wrapping mechanism and the second section is the control system to control this mechanism. A PIC18F45X is used to control all the operations. A Light Dependent Resistor (LDR) is used to detect the intensity of light on the feeder and give signals to the controller. A sealing machine is used to seal the packet which will be the last step of the packaging process.*

*PLC's are used in most of the industries but in this project, we are doing the same work done by the same mechanism by using a different controller. The main advantage of using a PIC is that it reduces the cost of the process to a great extent.*

**Keywords—PIC controller, PIC18F458, Wrapping Machine, LDR, etc.**

## I. INTRODUCTION

Food packaging is very essential and prevalent in the modern times. It protects the food we buy from the stores, from manufacturing through storage and to the consumer. The whole packaging sector is about 2% of the Gross National Product (GNP) in the developed countries and more than 50% of all the packaging is used to package food.

### A. Packaging Scenario in India

An estimated Rs. 280-300 billion per annum is the value of Indian market for all types of packaging of which consumer packaging is around Rs. 138 billion. The table shows the market for consumer packaging in 2002-2003.

**TABLE I**

| Product | Value (Rs. Billion) |
|---|---|
| Flexible packaging | 32 |
| Rigid plastics | 28 |
| Printed Cartons | 24 |
| Glass bottles and metal cans | 27(16+11) |
| Labels | 6 |
| Others | 21 |
| **Total** | **138** |

Below is the current scenario of India

- Though India is one of the largest producer of food and agro based products (estRs 500b), 20% gets wasted due to non-availability of processing/ packing/ inefficient supply chain – cold storage facilities etc.
- Food processing sector has the potential of attracting Rs 1,50,000crore (US$ 33 billion) of investment in 10 years and generate employment of 9 million person-days.
- Packaged food industry in India is growing at more than 15% p.a.
- India's food processing sector ranks fifth in the world in exports, production and consumption.

## II. SYSTEM DESCRIPTION

A package or a container should obey the basic functions such as containing, packing, communicating and differing. Therefore, in order to accomplish this, the package/container should meet the technical requirements of the products and meet the market demands; which if, bad or inadequate, can affect negatively and fail to deliver good product quality. The food packing machine should obey the conditions of simplicity, efficiency, efficacy, dependability, and most importantly it should be a solution for companies with adequate level production and lesser prices so that the companies can invest in the new machineries to increase their quality.

Let us now consider for example, a company which wants to improve the packing for 2 types of sauces. The main problem they are facing is the increase or high cost of the machinery. For the construction of the packing or wrapping machine, it is important to analyse each and every stage there is in the whole process.
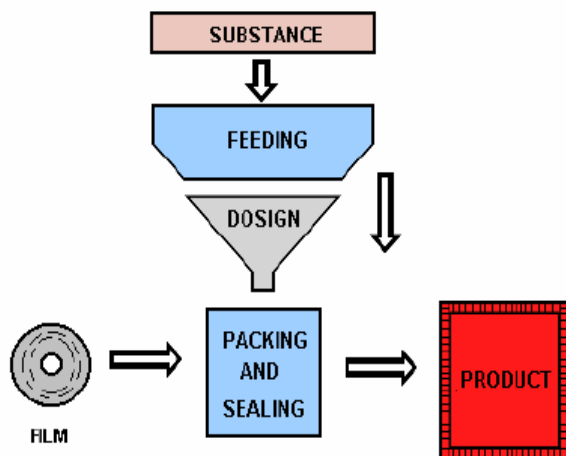


**Figure I: Food Wrapping Process Stages**

Sauces contain a high temperature of greases and oils and for this reason, phenomena such as self-oxidation and high temperature oxidation are analysed. Therefore, examining the effects of light and temperature over the various physical characteristics of the sauces and exposing them to various temperatures, it is possible to define a maximum conservation time of 10 hours at 298°K.

The feeding system supplies the item to be packed. This is done by a conical hopper. This conical hopper was designed by considering certain parameters that makes the flow of the product through it, easy.

The 2 types of actuation used by the machine are: ELECTRICAL and PNUEMATIC. The electric system controls the security of the machine and also activates the pneumatic system which actuates the valve and the horizontal seal. This interaction allowed us to frame the machine as a mechatronic system in which electric engineering, mechanical engineering, pneumatics and an additional component related with legal norms that regulate the processes from a food engineering point of view.
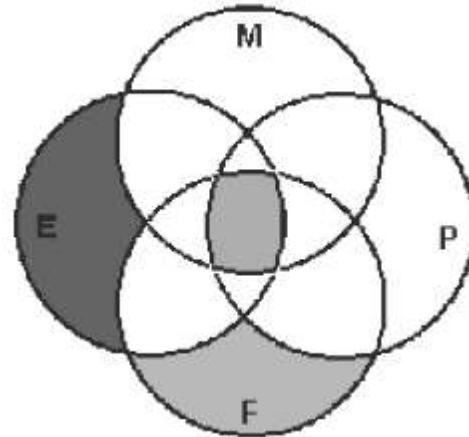


**Figure II: Mechatronic System Components**

## III. COMPONENTS DESCRIPTION

### 1. FEEDING SYSTEM

The hopper is designed so that it does not require product feedback.



**Figure III: Hopper Model**

The substance or the item to be packed is put into the feeder. The bottom of this feeder is provided to the valve to control the opening and closing so that the required amount is sent for further processes.

## 2. LIGHT DEPENDENT RESISTOR (LDR)

An LDR works on the principle of photo conductivity. We have used an LDR in this project to control the opening and closing of the valve. It is connected to the relay which in turn controls the opening and closing of the valve.

When light is incident on the LDR, more and more electrons are excited and the current flow is maximum thereby making the resistance negligible and vice versa.
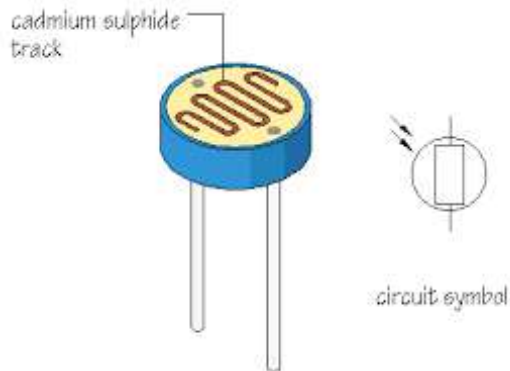


**Figure IV: Light Dependent Resistor**

## 3. PIC18F458 MICRO-CONTROLLER

The PIC18 consists of RISC architecture and it comes with some universal features such as program ROM, RAM, timers, ADC, USART and data EEPROM and input-output ports which varies among the members of the family.

This project is mainly based on PIC18F458. Various signals are sent to and from the micro-controller. Let us consider, we have to pack 1 kg of sugar. The pouch (package) is inflated and the sugar flows through the feeder and valve to the bag. The bag is placed on the load cell and this load cell is connected to the PIC18. When the PIC18 gets a signal after the bag becomes 1kg, the controller sends a signal to the relays and the valve is closed.

Similarly, the heater is also connected to the micro-controller and a particular time (in ms) and temperature is set. So to sum it up, the PIC18 is the most important component in this project.

## 4. LOAD CELL

A load cell is a transducer that converts an input mechanical force into an electrical signal and is commonly known as load sensors. In our project, we have used 4 strain gauge load cell.

The working of this load cell is explained above. A Wheatstone Bridge is the electrical circuit used in the load cell.
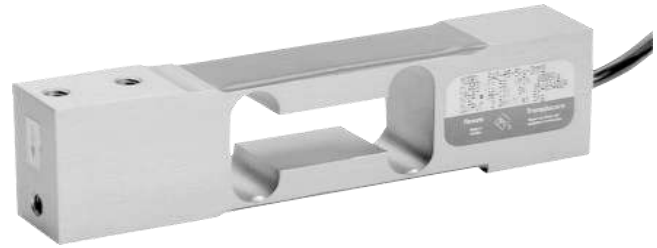


**Figure V: Load cell**

## IV. CONCLUSION

This food packaging machine that we have developed is semi-automatic. The average packing speed is around 20 packages per minute. One of the most important aspects that the machine complied with is the economic aspects and the cost. Comparatively, this machine that we have designed is cheaper since we have used a PIC18 micro-controller and companies can get an idea and use this for large scale purposes. This provides them with the same efficiency, simplicity and efficacy with lesser costs and hence they can deliver better quality of packaging.
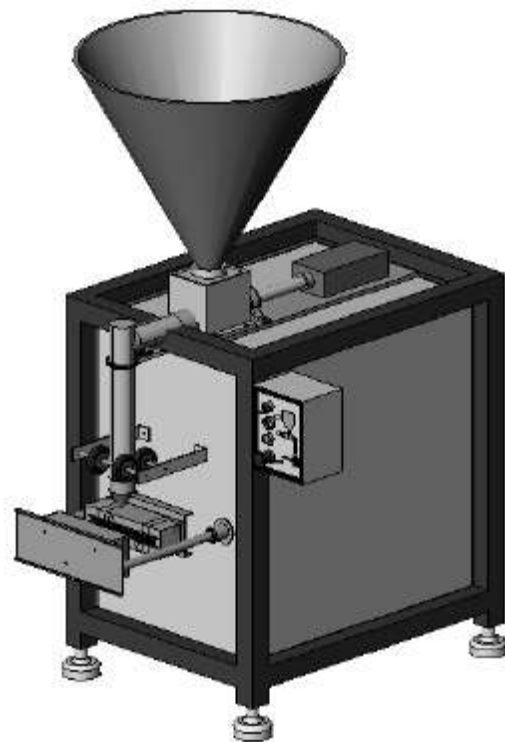


**Figure VI: Packaging Machine**

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